

# The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. LV  
No. 1424

SATURDAY, OCTOBER 12, 1946  
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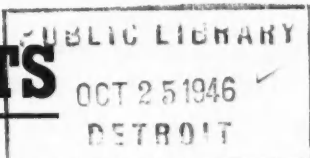
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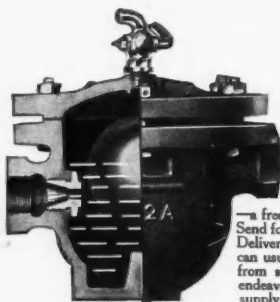
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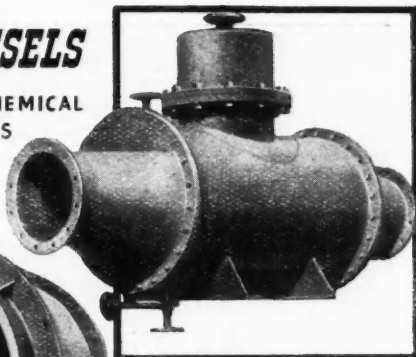




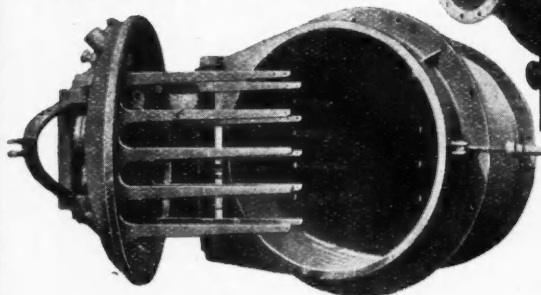
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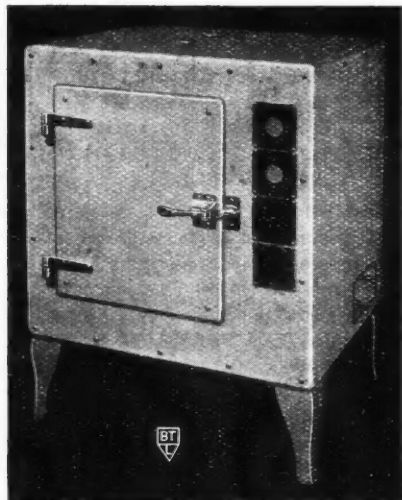


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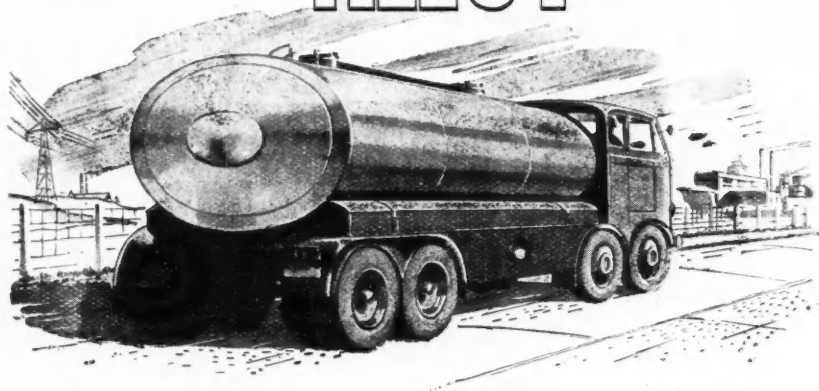
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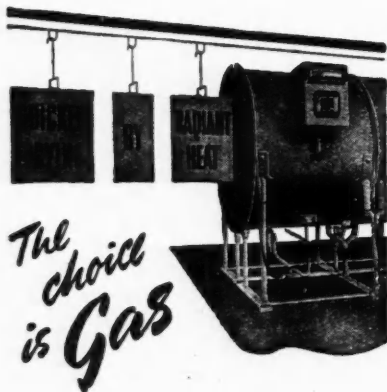
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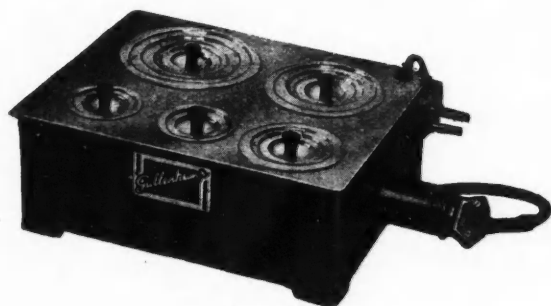
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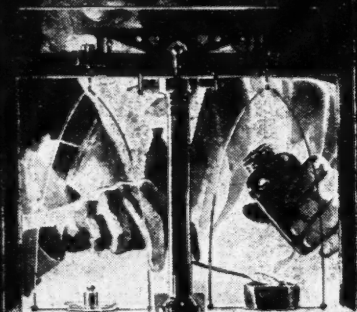
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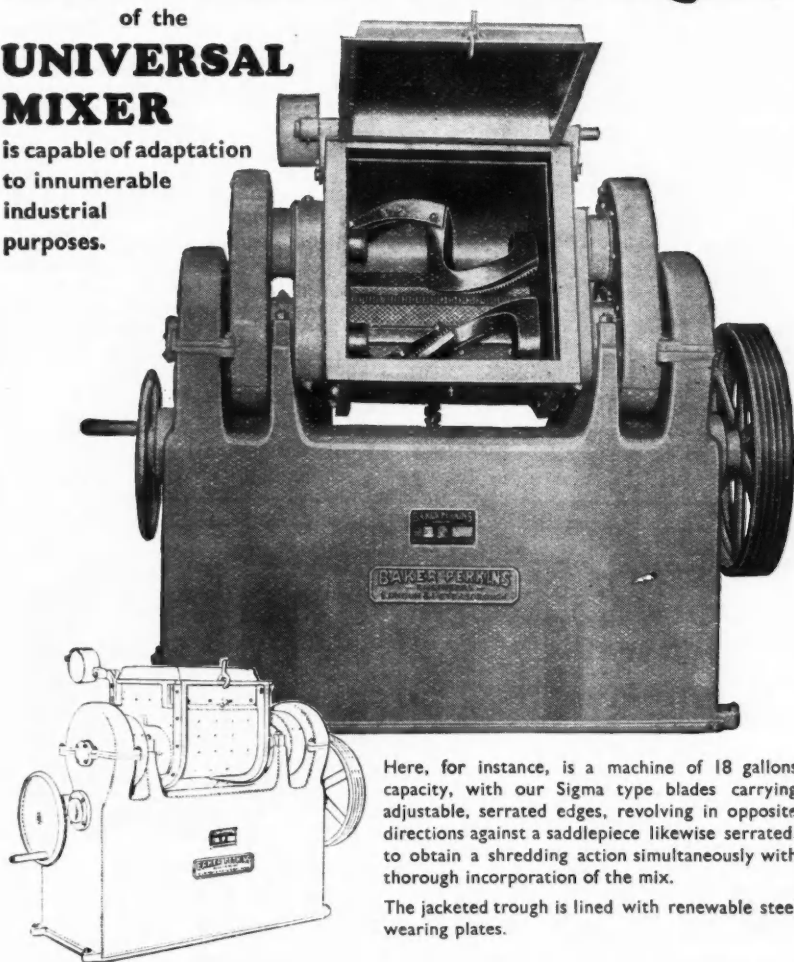
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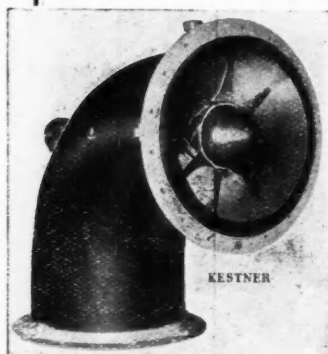


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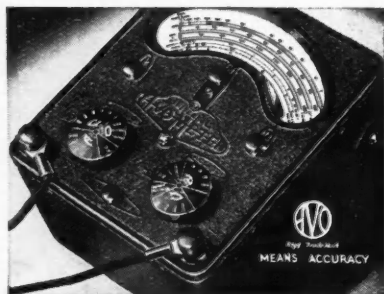
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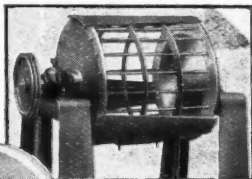
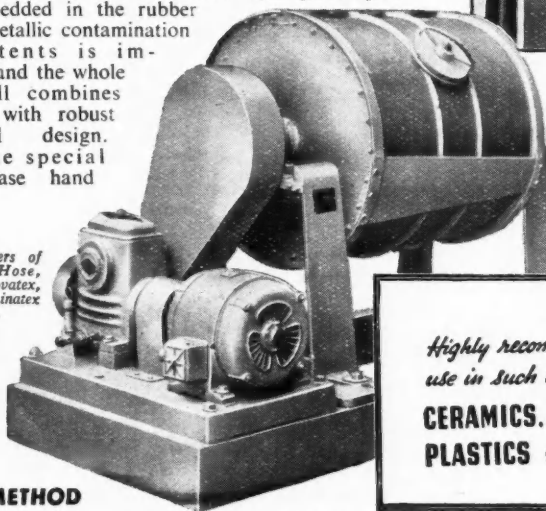
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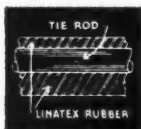
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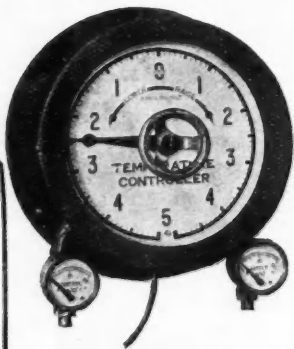
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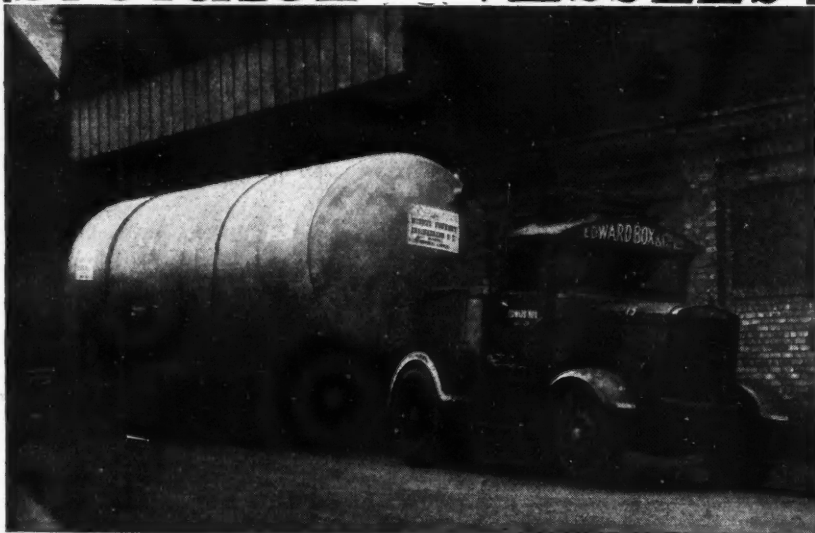
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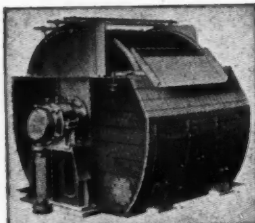
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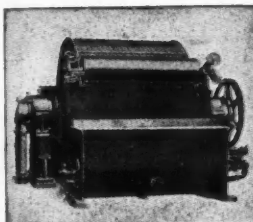
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# The Chemical Age

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## Damnosa Hereditas

FOR ten years we, the British people, have warred against the aggressors of Europe. From 1914 to 1918 we suffered in the mud of France and in the heat or cold of many climes. We and our allies triumphed; and our heritage was to sink with the world into a Slough of Despond such as needed a Bunyan to describe. The records of the strikes and labour unrest of the world in general and of this country in particular are written in the books of history, but in our hearts they are still vivid experiences. The world was lost in a mist of doubt, as it were, from which it failed to extricate itself in time. The uneasy peace in due season came to an end, and the world began again to prepare for war. In the preparations for war came temporary economic salvation. Workshops were busy again, mankind basked in the sunshine of prosperity—a spurious prosperity, perhaps, but proving something that we had known all along. It proved that what ailed the world was insufficiency of work. Put people to work, pay them adequate wages so that they might buy some at least of the things they need, and happiness and contentment would return. Of course, we knew that all along, as we have said; the trouble was that no one knew how to bring it about. The war of

1914-1918 left us with a ruinous heritage indeed: "*damnosa hereditas*" as old Gaius called it nearly 2000 years ago. The tower of Babel again played its fateful part in human history, and mankind, unable to speak the same economic language, failed to solve its troubles, even though the end to be achieved could be seen clearly.

Once again we have taken up arms against the same aggressor as in 1914-18. This has been a fiercer struggle, because not only the fighting men have been involved but also because the whole nation has been in the firing line with no quarter given or asked. The shouting and the tumult are dying away. The bench of international judges has laid bare, after the most historic trial the world has yet known since Pontius Pilate, the whole sorry story of intrigue, cruelty, and lust for power. It

may serve as a warning for the future, or it may not. Trials are held every day, criminals are convicted, sentences are passed—but crimes continue to be committed. What concerns us now, however, is the future. We cannot go back; we dare not stop to look back; mankind must go forward.

But the *damnosa hereditas* remains with us. Once more war has brought devastation and ruin. There is ruin in Germany, and in many enemy

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countries. We may say that that serves them right, but the nations of the world are like the pillars of a building. The fall of one or two of them may well bring the whole edifice down, as Samson showed long before Gaius wrote. The structure is inevitably weakened. Therefore, while taking steps to preserve peace, we must also now take steps to restore prosperity.

The ruinous heritage of war rests heavily upon this nation too. Let us look at the situation not from the political angle, but, so far as lies in our power, with the dispassionate view of the historian. It is always difficult to obtain the right historical perspective when events are happening around us, and to us. The predominant characteristic of our time is Socialisation. The earlier years of the industrial revolution in this country left much to be desired in the impact of their events on the mass of our people. The feelings engendered then have perhaps stayed in our subconscious minds so that to many people the events in Russia after the 1914-1918 war did not seem to be so much a *damnosa hereditas* as something to be welcomed and emulated here. We remained sane, fortunately, but this last war has indeed left us a ruinous heritage indeed. It has brought the great majority of our countrymen to declare in favour of socialisation of our way of life. Whether any particular industry is nationalised or not hardly matters from the historian's angle. He will see the events of the present time as part of a major movement in social history. It is accepted by our rulers that no one should be rich, but that every one should have sufficient. Their anxiety lest anyone should get an ounce more than another of the good things of this world has caused them to discourage the sending of private parcels of food from people abroad to those in this country—to such lengths has socialism gone! That is not a serious point of history; it is nothing more than one of the straws which betoken the direction of the wind.

The *Times* has recently written in a leading article about "the distinctive character of contemporary British policy and British achievement," which, it says, "constitute the claims to leadership in the world's councils." The article goes on to say: "In the General Election last year, which marked a definite stage, this distinctive attitude was given a distinctive form and emphasis; the centre of gravity was set markedly nearer to a planned economy

and farther from *laissez-faire*." The nationalisation issue is part of that "planned economy" of which the article speaks. It demands that a certain proportion of industry, probably an increasing proportion, shall be brought under the control of the State. Which industries are selected depends not in the least on whether they are individually well-run, as Government spokesmen would have us believe; it depends entirely on which ones will fit best into a planned economy.

The particular uncomfortable legacy which this latest war has left with us is that of control. Private enterprise is frowned upon. Initiative is stifled by the State in order that Socialism shall be established, so that we shall "go farther from *laissez-faire*." We are told what clothes we must wear; we are told how much food we may eat. Those who have lately journeyed abroad testify on their return to lands across the seas which, compared with Britain, flow with milk and honey; but we must have none of it lest the planned socialist State be placed in jeopardy. We are told that we may go to an exhibition and see things that are made in this country; but we must not touch them. They are for the foreigner, not for the inhabitants of a socialist State. Russia, and her five-year plan, is the prototype that our rulers now follow. Not for nothing did Sir Stafford Cripps spend part of the war as our ambassador to that country.

The result is disastrous. Faced with no incentive to work; with no prospect of amassing the wealth that is the spur to incentive; with nothing on which to spend any money earned, this nation is falling far behind in the international field. Our people do not work as they worked before the war and during the war, when there was something to work for. Our coal output goes down; strikes are prevalent; a spirit of discontent pervades the atmosphere. It is rarely that one meets a truly contented man, even less rarely a contented woman. Some of our personal friends have lately spent a considerable period in the United States. They have returned in despair at the difference between the two peoples. There they report an alert, confident, vital nation, full of the joy of living, and with something worth living to live for. Here, in contrast, they report despondency and a feeling of hopelessness, a country from which initiative and incentive have departed. It is true

that a few of our technical men retain their skill and energy; we speak not of the few, however, but of the many. What is the remedy—for remedy there must be if we are to survive.

The remedy, surely, is to give people something to work for. Socialism has not had a very long run yet, but it is already quite clear that whatever form it is given must not be such as to conflict with human nature. Unless a nation is to become a nation of slaves, there must be the incentive to progress, there must be freedom to progress in whatever way appears best to the individual. It may be that America has gone too far in that direction. Already there is alarm in that country because there

are not enough goods to buy with the wages that men earn. Americans are being urged to greater productivity. That must seem astonishing to Britons who have for so long been accustomed to regard America as the land of high outputs. But Americans have recognised the fact that if there is the means to purchase without the goods to purchase, there will be inflation. The British Government understands that too, we believe, but their solution is the reverse of that of the U.S.A. The British Government withholds the goods, thus removing the incentive to hard work, and *also* takes away whatever spare money we may secure, thus subtracting also the incentive to enterprise.

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## NOTES AND COMMENTS

### A New Textile—Some Day

**T**HERE appears to be no end to the initiative and ingenuity displayed by British research workers in the field of industrial science. On another page of this issue is recorded the development of yet another synthetic fibre, founded on terephthalic acid and ethylene glycol, and known, so far, by the name "Terylene." In this case the research was carried out during the war by workers of the Calico Printers' Association, and the development of the product has been entrusted to I.C.I. So far, so good. But now comes the rub, the ubiquitous obstacle against which so many high enterprises in Britain find themselves beating their wings to-day. It is as yet only on the laboratory scale that "Terylene" has been examined; and the report issued by those concerned with it says, somewhat bitterly, that even if its early promise is fulfilled, it must be years rather than months before the fibre can be available in appreciable quantities for the textile industry. And why? Simply because of "the delays that occur in the development of all projects at the present time, arising out of difficulties of supply of equipment and buildings."

### No Spur to Action

**T**HIS complaint, we know, is only too well justified; on every side we find evidence of the "drab disheartenment and frustration" which Mr. Churchill spoke of only last week. How mystified the Germans must be when they read that a country which, with half its man-power away,

could yet produce aircraft enough to beat off the prepared assault of the Luftwaffe; which could in a few months achieve the completion of the Mulberry harbour so as to make possible the invasion of Europe, can now no longer raise the energy to develop a new and valuable industrial discovery! The clue, of course, is the complete absence of incentive. Then, in 1940 and 1944, our lives and liberties were at stake; but what is there to be gained now? Presumably the right to pay a larger proportion of Income Tax, or the duty to apply for more and better licences. It is not enough. To better ourselves, we are told, is immoral: it savours of the "profit motive." Unhappily, however, it becomes daily clearer that socialist theory has completely failed to find an alternative spur to action.

### Conference on World Tin

**T**HE International Tin Conference which began its deliberations on Tuesday was called into being by the British Government after consultation with the Governments of the United States, the Netherlands, Belgium, and Bolivia. It was convened, in the words of Mr. John Wilmot, Minister of Supply, who opened the conference, so that "all the main interested countries, both producers and consumers, should together consider the prospective world tin position and consider whether continuous inter-government study of that position is required." Although tin is an expensive metal it has unique qualities which make it an essential metal for industrial use. It

is non-toxic and is therefore indispensable to the food industry which uses half the world's supply in food containers. Its low melting point, low thermal conductivity and extreme ductility ensure a big demand for the metal in solder and bearings of all kinds. Any shortage of tin, therefore, has repercussions on many industries.

### Present Tin Shortage

THE six principal Eastern tin areas from which most of the pre-war supply of tin was obtained—Malaya, Dutch East Indies, Siam, China, Burma, and Indo-China—will this year export about 20,000 tons compared with 160,000 tons in 1941. Although there is a reserve of 90,000 tons of tin, most of it in the United States, this is only sufficient for a six months' supply at the 1939 rate of consumption. Many of the Far Eastern mines are in areas which were overrun by the Japanese who had no large tin demands, so the mines became derelict and the machinery was either left to rust or removed elsewhere. These mines now have to be rehabilitated. Old equipment has to be repaired, or new machinery provided. In Malaya where labour was dispersed by the Japanese, a new force will have to be recruited. And in some other areas political complications must be cleared up before mining is renewed. Several years may elapse before large supplies of tin again become available. But although there is a present shortage of tin, the British Government is looking forward to the time when supply outstrips demand. And with the tin regulation scheme, which has been in force for the past 15 years, terminating at the end of this year, the International Tin Conference was convened so that it could decide whether continuous inter-government study of the tin position is advisable. If it does think so then a wider organisation than the present two international bodies—the International Tin Committee and the Combined Tin Committee—charged with the task of keeping the tin position under constant review may be called for.

### A Precarious Profession

A CORRESPONDENT in an Australian mining journal bemoans the shortage of good prospectors and refers with nostalgia to the bygone days when prospectors, unlike their present-day successors, "could tell gold when they saw it." This set us

thinking about the qualities and education, if any, which a prospector needs to be successful in his frankly precarious profession—a profession for which, apparently, a university education is not a *sine qua non*. First and foremost stand good health, good eyesight and an ability to withstand hardship. Given this physical make-up, what are the qualifications to be acquired before setting out on the trail? An essential is knowledge—and not merely a superficial knowledge—of the minerals sought, and an understanding of the kind of rock in which they usually occur and the conditions in which they form. One who from the very nature of his work is well seasoned for prospecting work is the miner. But he usually lacks the essential broad knowledge of minerals and geology. Nevertheless, mining is the best preliminary education for prospecting if the miner has an agile mind free from prejudice and is not always ready to jump to conclusions.

### Knowledge of Low-Grade Ores

AS the present-day prospector is unlikely to strike a "bonanza," he must have sufficient knowledge to decide whether the low-grade ores which are his usual finds will justify the expenditure of labour and time in their exploitation. He must have an inquiring and open mind so that the obvious, and perhaps wrong, conclusion is not instantly accepted. And he must possess a faculty of observation so trained that anything unusual, a slight change in the colour of the rock or the occurrence of unique vegetation, is sufficient to make him stop and investigate. Apart from use of his technical knowledge, the prospector will also have to exercise much ingenuity in other directions. In the field he will have to do his own cooking as well as his own blacksmithing. In order to live he must know how to hunt, stalk and fish. Above all, to obtain the best results from his labours, he must persevere. Obviously, many of the qualifications needed cannot be obtained simply by attendance at a college. They can only be acquired gradually by young men in the field, working alongside experienced prospectors.

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A three-year plan for the expansion of the Netherlands nitrogen industry has recently been submitted to the Government. It is expected to increase output from the present figure of 168 tons daily to about 300 tons.

# The Catarole Process

## Aromatic Hydrocarbons Produced from Petroleum

IN last week's issue of THE CHEMICAL AGE (p. 405) an account was published of the formation of a new British company to operate a process, called the Catarole process, for the production of aromatic hydrocarbons from petroleum. The paragraphs which follow contain some details of the inception of the process, together with information on the working of the process and on the nature of the resultant products.

During the past ten years it has become more and more evident that coal is no longer the only or even the main source of aromatic chemicals, and that it is possible to transform aliphatic hydrocarbons into aromatics of the same carbon number with the aid of catalysts such as alumina and promoters such as chromium oxide.\* For various reasons, however, only few individual aromatic hydrocarbons have become available by working that process on a technical scale.

Coal, on the other hand, makes available the whole range of aromatics at once, but the extent to which coal tar can be produced obviously depends on the extent to which the coke, the main product of the process, can be commercially utilised.

### Whole Range from Petroleum

Further research into the conversion of aliphatic hydrocarbons into aromatics has shown that it is possible to treat any non-aromatic charging stock in such a manner that the whole range of aromatic hydrocarbons is obtained. Petroleum is, therefore, no longer second to coal as a source of aromatic hydrocarbons. Also, the choice of special charging stocks or fractions and of the processing conditions makes it possible to vary the quantitative composition of the resulting aromatised product. If petroleum is passed through a packed tube at atmospheric pressure at 630-680°C. and a velocity of 0.05-0.5 litres per hour and litre catalyst volume, the resultant liquid has an aromaticity of at least 95 per cent. In addition, valuable gaseous products are formed. The use of metals (such as copper), as packing materials, reduces the temperature required for substantial aromatisation to 630-680°C., also the extent to which carbon formation takes place. These two factors, combined with the purity of the products, make the process economic.

The Catarole process can best be described as a high-temperature catalytic

cracking process designed primarily to produce chemicals. Any petroleum distillate boiling below 300°C., that is, naphtha, kerosene, or gas oil, can be used as charging stock, but non-petroleum charging stocks such as oils from the low-temperature carbonisation process of coal or crude coal-tar benzols of low specific gravity have also been used with advantage.

### Transformation of Charge

In the course of the process the charge is transformed into: (i) A liquid product consisting of up to 95 per cent. aromatic hydrocarbons and containing the whole range of aromatic hydrocarbons from benzene up to chrysene, pyrene, etc. and (ii) a mixture of gases rich in olefines, and again containing the whole range of petroleum gases from butenes and butanes to methane. Sulphur compounds which are present in the charge are largely eliminated as hydrogen sulphide. The losses in the process are very small, they are of the order of 0.5-1 per cent. and consist mainly of carbon which in the course of the reaction is deposited on the catalyst.

A pilot plant working this process has been in operation for five years. This plant has a capacity of 0.8 tons of charge per 24 hours. It consists of a vaporisation coil, and a number of reactors filled with catalyst, all of which are contained in gas-heated furnaces. The cracking gas itself is used to feed the burners. A quenching and condensation arrangement is provided, also gas-liquid separators and liquid storage tanks, and finally gas scrubbers. The operating pressure is slightly above atmospheric and the operating temperature is of the order of 600-700°C. The catalyst is cheap, of a robust nature and has a long lifetime. Runs are generally carried out for about 50-70 hours, and after that time the carbon deposits accumulating on it have to be burnt off. This is done in the conventional manner by recirculating flue gases with simultaneous injection of a controlled amount of fresh air. The regeneration process takes about 10 hours. An operating cycle, therefore, consists of 50-70 hours on stream and 10 hours regeneration. The pilot plant has been used to process a considerable number of widely different charging stocks to check yields, obtained previously in the laboratory, and to obtain various thermal and other design and operating data.

The proportion of gaseous to liquid products can be varied to a considerable degree by selection of appropriate charging stocks. In general the more paraffinic a charging

\* See, e.g.: Moldavsky and Kamusher, *Chem. Zentr.*, 1936, 11, 2339, 6713; Moldavsky, Besprozvannaya, Kamusher and Kobilskaia, *Chem. Zentr.*, 1938, 11, 1023; Grosse, Morrell and Mattox, *Oil and Gas J.*, November 24, 1939; U. S. P., 2,124,536; 2,124,537; 2,124,183-6; Taylor & Turkevitch, *Trans. Faraday Soc.*, 1939, 35, 921.



stock the greater the proportion of gaseous products, and the more naphthenic or aromatic a charging stock the greater the proportion of liquid products. This is reflected by the experimental result that, for fractions of different chemical composition but of the same boiling range, there is a rough proportionality between the density of the charging stock and the yield of liquid products.

Another way of increasing the proportion of liquid products is to use higher boiling charging stocks. Generally, the rule holds that the higher boiling the charging stock, the greater the proportion of liquid products. These general considerations are borne out by typical analysis given in Table 1 opposite, of the cracking products from (a) a naphthenic naphtha of East Texas origin, (b) a paraffinic naphtha of Iranian origin, and (c) a paraffinic kerosene of Iranian origin.

As far as the gases are concerned, it will be seen that the proportion of olefinic hydrocarbons is considerably higher than in any normal cracking gas and that the Catarole gas is particularly rich in ethylene and propylene. A complete process for separation of these gases by low-temperature refrigeration and subsequent fractionation has been worked out and the corresponding plant is now being built together with the large-scale cracking plant. The butylene fraction is stated to contain 60 per cent. *n*-butylenes, 30 per cent. isobutylene, and 10 per cent. butadiene.

### Liquid Products

These can be divided into light products boiling below 200°C., and heavy products boiling above 200°C. Of the light products there is:

(a) A small head fraction containing cyclopentadiene, isoprene, and various pentenes and isopentenes. By hydrogenation of this fraction, there is obtained an excellent aviation fuel additive of the isopentane type (octane number 84 as compared with 89 for isopentane).

(b) *Benzene Fraction.* From this there is obtained by refractionation, preferably, but not necessarily, by azeotropic distillation with methanol, a benzene fulfilling all the requirements of the British and similar nitration benzene specifications. Refining losses are very small.

(c) *Toluene Fraction.* In a similar manner from the toluene fraction by straight fractionation by azeotropic distillation with methanol, there is obtained a nitration toluene fulfilling all specification requirements. Refining losses are again very small.

(d) *Xylene Fraction.* This fraction contains, on an average, 16.2 per cent. *o*-xylene, 19.3 per cent. *m*-xylene, 24.7 per cent. *p*-xylene, 10.8 per cent. ethylbenzene, and about 20 per cent. styrene. By further

fractionation, this styrene can be concentrated up to 50-60%, and from this concentrated solution a polystyrene of satisfactory molecular weight and mechanical properties can be obtained by polymerisation. Alternatively, this styrene concentrate is a very useful material for copolymerisation processes with other monomers. After removing the styrene by polymerisation, there remains a residue from which a 2°, 3°, or 5° xylol fraction which passes all required specification tests can be obtained.

TABLE 1

Boiling Range (Engler)		(a)	(b)	(c)
5%-95%		95-205°C.	113-183°C.	175-261°C.
Density 20°C.		0.799	0.756	0.796
[Yields in % by wt. calc. on total products (processing losses approx. 1%)]				
<i>Gaseous Products.</i>				
Hydrogen	0.5	0.9	0.5	
Methane	18.3	24.0	13.7	
Ethylene	7.4	11.6	11.6	
Ethane	6.5	9.6	7.4	
Propylene	9.0	10.6	10.9	
Propane	1.9	1.3	1.4	
Butylene	4.8	4.5	3.9	
Butane	1.3	0.8	0.5	
Total gases	50	63	50	
<i>Liquid Products</i>				
Below benzene	1.1	0.4	1.0	
Benzene fraction	11.0	6.1	7.5	
Toluene fraction	11.0	6.5	7.5	
Xylene fraction	6.0	5.1	5.8	
Alkylbenzene fraction	2.6	4.5	9.4	
Naphthalene fraction	3.5	2.5	3.7	
Alkyl-naphthalene fraction	4.0	1.7	3.8	
Anthracene fraction	2.7	2.6	2.3	
Chrysene fraction	2.4	2.6	1.6	
Pitch residue	6.0	4.0	7.5	
Total liquid products	50	37	50	
	(a)	(b)	(c)	
Refined naphthalene	2.3	1.2	1.7	
Anthracene	0.2	0.1	0.15	
Phenanthrene (80%)	0.5	0.3	0.4	
Chrysene	0.3	0.2	0.2	
Pyrene	0.2	0.1	0.15	

(e) *Alkylbenzene Fraction.* This fraction contains about 50 per cent. of polymerisable bodies consisting mainly of indene and isopropenyl benzene. A process has been worked out to obtain from this material by polymerisation a hard and light-fast



resin which, according to tests carried out by a number of manufacturers, is an excellent material for incorporation into varnishes. After removal of the polymerisable bodies the remainder of this fraction constitutes a valuable aromatic solvent.

(f) *Naphthalene Fraction.* From this fraction naphthalene crystallises and is separated on centrifuges. After a slight washing treatment this naphthalene is sufficiently pure for the production of phthalic anhydride. By treatment with a very small amount of aluminium chloride (B.P. 571.398) a very pure naphthalene for sulphonation can be obtained from the centrifuged product.

It appears appropriate to comment on the composition of the polycyclic fraction of the reaction product, as the process to which this report refers has succeeded for the first time in converting petroleum into the whole range of such substances. They are of interest to the manufacturers of dyestuffs, pharmaceuticals, and other organic chemicals.

### Alkyl-naphthalenes

In this fraction occur not only  $\alpha$ - and  $\beta$ -methyl-naphthalene and various dimethyl-naphthalenes (of which the 1.2, 1.6, 1.7, and 2.6 have been identified), but also 1.2.5- and 1.2.6-trimethyl-naphthalene, diphenyl, acenaphthene, and fluorene, all of which can be isolated by further fractionisation. The yields of these various bodies calculated on the alkyl-naphthalene cut are as follows:

$\alpha$ -Methyl-naphthalene	16.4
$\beta$ -Methyl-naphthalene	24.5
Diphenyl	4.1
Dimethyl-naphthalenes	30.4
Acenaphthene	3.6
Trimethyl-naphthalenes	18.0
Fluorene	3.2

% by weight of methyl-naphthalene cut.

From the crude anthracene cut a mixture containing all the anthracene and a great part of the phenanthrene crystallises. By refractionation of the mother liquors a further quantity of phenanthrene is obtained. From the crystalline part of the fraction very pure anthracene of melting point from 210°C. upwards is obtained by two crystallisations from toluene. In the toluene mother liquors there remains phenanthrene and some oil from which, after purification, phenanthrene of 80 per cent. purity is recovered.

From the chrysene-pyrene fraction chrysene crystallises spontaneously, and after one or two recrystallisations, is obtained pure. After refractionation of the remainder of the cut crystalline pyrene is obtained in nearly pure quality.

The residue from the distillation of the liquid fraction is a valuable starting material for the production of electrode coke. A high quality electrode coke must contain a

minimum only of inorganic impurities. Since the Catarole pitch is subjected to at least two distillation treatments, it is clear that this requirement is likely to be fulfilled. This has been verified in a number of analyses (inorganic content of coke from pitch 0.01-0.015%).

It is interesting to note that the only side-chain appearing in these substances is the methyl group. This is undoubtedly due to the fact that longer side-chains are broken off (in form of the corresponding olefines) at the process temperature. In the "alkyl-benzenes" fractions, too, polymethylated benzenes predominate. They are, however, accompanied by substances in which the unsaturated nature of the side-chain increases the stability of the molecule (resonance stabilisation), such as styrene,  $\beta$ -methylstyrene, and indene. The relatively high percentage of styrene, ethylbenzene, and pyrene is likewise interesting; it is believed that this fact will shed some light on the reaction mechanism.

The gaseous products, as will have been seen, are highly unsaturated. All syntheses starting from these olefines (glycol and glycol derivatives, isopropyl alcohol, acetone, etc.) thus become possible. The industrial success of the whole process depends to a large extent on the proper utilisation of the olefinic gases.

The practical importance of the process lies mainly in the fact that it produces simultaneously a wide range of those aromatic and aliphatic hydrocarbons which form the basis of the modern production of organic chemicals, and that it produces them in a state of high purity. Thus, the process may well be able to supplement the coal-tar industry which is, and is likely to remain, the mainstay of British chemical industry.

## Fat Shortage

### More Retained by Producers

**R**ESTRICTED production may prevent the output of the world's fats and oils from reaching the 1935-1939 level for three years or more, reports the U.S. Department of Agriculture. During 1946 import requirements have been double the supply available for export. Although higher yields of Manchurian soya bean and Sumatran palm-oil could normally have been looked for in the near future, political unrest in these areas may prevent increased production. Other producing areas, such as India, may themselves consume much larger proportions of their output. An additional depressing factor is the international agreement to limit Antarctic whale oil production to about half the 1938 level. On the other hand, because of reduced purchasing power, some importing countries may not be able to buy so much as they did before the war.

# Streptomycin in Britain

## Boots Planning Large-Scale Production

**B**RIEF reference was made in THE CHEMICAL AGE (see p. 400) to the press conference on streptomycin which was held on October 1 by Boots Pure Drug Co., Ltd., at the London headquarters of the company in Stamford Street, S.E.1. The company is the first British firm to install plant for the large-scale production of this drug. Moreover, it plans to replace the present method of surface culture in milk bottles by deep culture in tanks, and has provisionally allocated £67,000 for the proposed plant.

Sir Jack Drummond, D.Sc., F.R.S., director in charge of the company's scientific research, said the discovery of streptomycin was a natural outcome of the discovery of penicillin and was made in America, where conditions for going ahead with it were far more favourable than in this country. Now ten U.S.A. firms were concerned in its production and they were all bound up with the American Streptomycin Clinical Trials Committee. He thought some similar organisation in this country would ultimately be set up to control its distribution here, and to ensure that the development of streptomycin, which would take several years, was in the right hands. The greatest interest in streptomycin at the moment attached to its effect on tuberculosis. Laboratory tests on animals had shown striking results in this direction and highly encouraging, although not uniformly satisfactory, results had been obtained from small-scale trials in human beings in the U.S.A. The key to the whole problem was whether streptomycin had merely a repressive effect on tuberculosis, or whether it would bring about a complete cure. Besides tuberculosis, there were several other diseases, such as typhoid, meningitis, etc., which, it was hoped, could be cured by the use of streptomycin, and arrangements were being made for discovering its effect on leprosy.

### Advantages Over Penicillin

Streptomycin, Sir Jack went on, was a white powder, with nothing striking in its appearance, but it differed from penicillin in one or two important respects. One of the most disturbing problems in connection with penicillin was that there were at least four different types, each with a somewhat different action, and until they were certain of the potency of the different types in their treatment of different diseases, and it was produced in a state of purity, they would not have a complete picture of the penicillin story. Moreover, penicillin was rather an unstable product. He did not think they

needed worry about a multiplicity of types of streptomycin; there was only one, and it was much more stable than penicillin. The chemical structure of streptomycin was pretty well resolved, but it looked like presenting the organic chemist with one of the most heartbreaking problems he had known, because of the difficulty of synthesising it. Another drawback was that at present it had to be given by injection, and the dose, in the case of tuberculosis, was a large one. Besides human diseases, there was a vast field in veterinary science to be considered. There would inevitably be considerable delay before large-scale production was possible. Even in the U.S.A. present production was at the rate of only about 35 kg. a month.

### Elaborate Process

The process of manufacture of streptomycin was an elaborate one, similar to that used in producing penicillin. In the surface-culture methods, spores of *Actinomyces griseus* were sprayed on the surface of a medium containing sugar and meat extract, or corn-steep liquor, which was filled into milk bottles from a conveyor belt. After two or three days, white spots appeared on the surface, and these later fused together into a thin white mycelial felt. Streptomycin was excreted in measurable quantities after the seventh day. After 14 days, the mould was discarded and the liquor made acid; then it was pumped through charcoal filters, which absorbed impurities. After further stages of purification and freeze-drying, a white powder emerged. This was packed into sterile ampoules by rubber-masked and gloved workers, working with their hands under glass to prevent contamination.

The cost of producing sufficient streptomycin for the three-months course of treatment at present considered necessary for a tuberculosis patient, said Sir Jack, worked out at about £3000, employing the surface-culture method; this figure was based on American costs. Boots Pure Drug Co. was planning to replace surface culture in bottles by deep culture in tanks, and £67,000 had provisionally been allocated for the proposed plant. By that process, the cost might be reduced to one-quarter of the present figure. Subsequently, mass production was likely to bring the cost down steeply, as had been the case with insulin and penicillin.

Answering questions, Sir Jack said reasonable quantities of streptomycin would be available within six weeks, and production at first would be at the rate of about 2 kg. a month. In the first U.S.A. tests, there

Fig. 1 (below) shows Boots' pilot plant for small-scale deep tank culture of streptomycin. The nutrient medium is being inoculated with streptomycin spores.

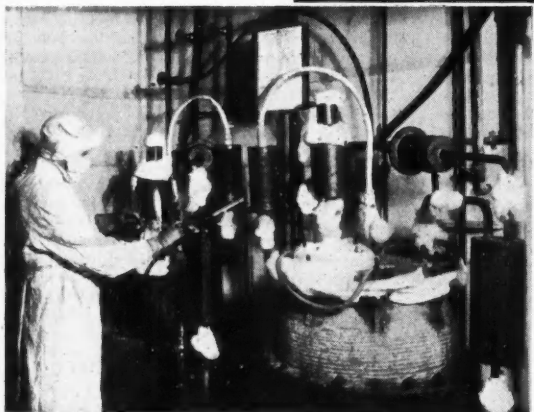


Fig. 2 (above). Final extraction stage. Bottles containing the streptomycin-loaded liquid in its penultimate state are spun at 1000 r.p.m. in a temperature of minus 50° C. preparatory to "freeze-drying."

was some evidence of toxic effects when large quantities were used, but he thought he could safely say there would be none in this country in the sort of doses given in clinical medicine.

Dr. J. B. M. Coppock, B.Sc., Ph.D., F.R.I.C., head of the company's technical development and fine chemicals division, said streptomycin might well take its place alongside penicillin.

## Plastic Paper Sheet

### New British Standard

IN view of the increasing demand for laminated plastic materials for building and interior decorating great interest will be aroused by the issue of B.S. No. 1323, Thermosetting, Synthetic-resin, Bonded-paper Sheet for use in the Building Industry. This specification covers sheet made with phenolic-type resins, with urea or other aminoplastic type resins, or with both, supplied for use as wall-board or for veneering on to wood or other surfaces in thicknesses from 1/32 in. to 1/2 in. The sheet may be ordered as "finished panels," ready to be fixed without further cutting; or as "sheets for fabrication," intended for cutting or trimming by the purchaser.

The specification lays down nominal

dimensions and tolerances, together with requirements for appearance, flatness, and straightness of edges and squareness of rectangular, finished panels. It also specifies cross-breaking strength and resistance to impact, to water absorption, to marking by hot water, alcoholic liquids or hot fats, to dry heat or damp heat and to the spread of flame. Requirements for satisfactory machining qualities and for certificates by manufacturers are also given, together with full methods of test and additional information upon such properties as density, thermal conductivity, lack of action on metals, and dimensional stability and upon recommended types of finishes which will be of the greatest interest to users. This publication may be obtained from the British Standards Institution, 28 Victoria Street, S.W.1 (price 2s.).

# Digest of Statistics

## Chemical and Allied Production and Consumption Figures

**F**URTHER decreases in the production and consumption of certain chemicals and fertilisers in the U.K. during July are recorded in the recently-published September issue of the *Digest of Statistics* (H.M.S.O., 2s. 6d. net). The figures given represent thousand tons.

Sulphuric acid production, i.e., as 70 per cent. acid and including acid made at Government factories, was 156.6, which is 4.7 less than the June figure and 7.7 less than that for May. The consumption of sulphur for the manufacturer of sulphuric acid was 16.6, as compared with 17.0 for June and 17.9 for May. There was, however, an increase in sulphuric acid consumption, the July figure of 159.0 being 7.0 above that for June, although 17.0 below the record figure for May. Stocks of sulphur for the manufacture of sulphuric acid, which dropped in June to 58.1, after being 69.3 in May, again dropped in July, the figure being 56.7, while sulphuric acid stocks went down to 89.6 after being 92.7 in June and 81.4 in May.

### Fertilisers

Superphosphate production, which reached the record figure of 95.4 in May and went down to 75.1 in June, dropped in July to 73.3. On the other hand, the consumption of superphosphate, which includes deliveries to consumers and the amounts used in compounds, rose to 76.1 after being 64.8 in June and 111.9 in May. There was an all-round improvement in the position of compound fertilisers. Production rose from 80.9 in June to 91.7 in July, and consumption jumped from the low figure of 18.9 to 53.4.

Consumption of pyrites remained almost unchanged, the July figure of 17.5 comparing with the previous month's figure of 17.6. Stocks, however, are shown as having been reduced from 88.0 to 85.0. Spent oxide consumption was unaltered at 15.6, but stocks showed a slight increase—139.6 as compared with 139.0.

The consumption of phosphate rock for fertilisers showed an improvement, the July figure of 54.9 being 4.5 better than that for June.

Ammonia consumption, including exports and deliveries to consumers in the U.K., but excluding ammonia produced in by-product factories and converted directly into ammonia sulphate, was 24.29, as compared with 25.51 for June. Stocks rose from 3.11 in June to 3.44 in July.

August production of iron ore went up slightly, the figure of 224.0 being 2.0 better than the July figure, although 2.0 below that for June. Pig-iron production again

dropped, this time to 145.0, after being 147.0 in July and 152.0 in June. The August production of steel ingots and castings was the same as that in July—226.0—this figure including 11.0 alloy.

Among non-ferrous metals, the total disposals of virgin copper in July were given as 26.1, as compared with 23.7 in June and 30.2 in May. Stocks in July totalled 83.3, which is 2.4 better than the June figure. Virgin zinc disposals were 17.8—an improvement of 0.7 over the June figure—and stocks dropped from 78.2 in June to 70.4 in July. Consumption of zinc concentrates in July is given as 14.0, which is 2.9 less than in June, and stocks went down from 125.0 in June to 111.0 in July. Total disposals of refined lead in July were 17.8, which is 1.4 above the June figure. Stocks are given as 23.0, as compared with 33.7 for the previous month. Tin metal disposals in July were 17.8, which is 1.34 above the June figure, and stocks dropped to 20.0 after being 22.4 in July.

After showing an increase for the first time in seven months, the number of people employed in chemical and allied works (in thousands) dropped from 227.8 in June to 226.7 in July (including 78.4 females).

## Norsk Hydro's Future

### State Control Suggested

**N**EGOTIATIONS have been opened between the French and Norwegian Governments concerning the ownership of the majority holding in the "heavy water" Norsk Hydro concern. Before the war, French shareholders held 75,000 shares in the concern, but these were purchased in 1941 by Germans. A French court has pronounced this transaction invalid, and the French Government has now applied to the Norwegian Custodian of Enemy Property, who at present holds the shares, for their return to the former French shareholders.

The Norwegian Minister of Commerce, Mr. Lars Evensen, however, has declared that the Norwegian Government cannot accept the ruling of a foreign court, and that a settlement of the matter must await the decision of a Norwegian tribunal. He affirmed that a key industry of such importance should not be controlled by any foreign power, and that the company should be placed under state control.

The share capital of the Norsk Hydro at present amounts to 156,400,000 kroner and that of subsidiaries to over 100,000,000 kroner; all shares save those under dispute are held by the Government.

# Synthetic Resins

## Their Use in Varnish and Allied Industries

by A. E. WILLIAMS, F.C.S.

THE introduction of synthetic resins to the varnish and allied industries has resulted in considerable improvement in the quality of varnish, finishes, printing inks, etc., and in some cases has widened the sphere of usefulness of these products.

For example, with the aid of suitable synthetic resins it is now possible to prepare coatings which have a very high resistance to chemical action, while other types of coating may be prepared to give good fire resistance. Such features often result in considerable economy, for a varnish with good chemical resistance may be used to coat equipment and plant which is of itself vulnerable to chemical action, and so is much cheaper than chemically-resistant plant. In a similar manner the use of fire resistant coatings results in a reduction in the insurance premium, since the fire hazard is lowered, and often enables timber to be used where the more expensive metal would normally be required. The special properties of synthetic resins have made it possible to produce varnishes and finishes which have a durability and stability far surpassing that of products made solely from natural raw materials. It is interesting, therefore, to consider briefly typical examples of these British-made resins and the methods of using them to obtain optimum results.

### Chemically-Resistant Resins

Resins with a high resistance to chemical action are usually employed by varnish manufacturers when preparing products to withstand not only chemical action, but also weathering, moisture, etc., to give a product which dries rapidly and possesses flexibility and toughness. A typical example of a well-established chemically-resistant resin is Bakelite R-254, which appears to have been the first concentrated phenolic resin of the oil-soluble type to be offered to the paint and varnish industry. Since this product contains no rosin, ester gum, oils, etc., it differs from the phenolic type of material previously available. Its physical properties are as follows: Sp. gr. 1.19 to 1.22 (Westphal balance method); m.p. 195° to 225°F. (modification of A.S.T.M. ball and ring method); colour, IL-2 (Hellige Comparator standard on solution of 50 per cent. resin, 50 per cent. toluol); acid number, 85 to 105 (resin dissolved in 75 per cent. benzol, 25 per cent. alcohol and titrated with tenth-normal alcoholic sodium hydroxide, using phenolphthalein indicator).

A product which has high resistance to

weathering must of necessity possess high resistance not only to oxidation but to the effects of prolonged exposure to sun and rain, without losing its flexibility and mechanical strength. Experience has shown that when this resin is used exclusively as the resin content of the varnish, under normal conditions the useful life of the film is inversely proportional to the oil length, the shorter oil varnishes giving the longer life. In practice, factors other than durability have to be considered, and generally oil lengths of 2½ : 1 or 2 : 1 are chosen. This resin has high resistance to water and with a 2½ : 1 chinawood oil varnish there is no appreciable swelling of the film on immersion in water for 24 hours, while the same film shows no sign of whitening on exposure to boiling water for eight hours. If linseed oil be substituted for chinawood oil, however, there may be a slight decrease in water resistance.

### Metal Protection

Where priming coats for metal protection are involved, the use of a chemical inhibitor—such as zinc chromate—is often desirable, since chemical action is invariably the cause of corrosion. In general, long oil varnish does not withstand the action of alkali as well as short oil products, e.g., a 4 : 1 film resists a 5 per cent. solution of caustic soda about twice as long as a 6 : 1 film; and a 2 : 1 twice as long as a 4 : 1 film, while a 1 : 1 varnish film normally withstands the above strength of caustic for several weeks.

Vehicles incorporating R-254 resin may be used with zinc oxide, or other basic pigment, without thickening or livering occurring, provided the vehicle is properly cooked, as a varnish containing oil-gel as a result of overcooking will generally give trouble with basic pigments in all circumstances. The addition of a small proportion of this resin will usually impart to vehicles rapid drying properties without an excessive use of metallic driers, and in many cases varnishes can be produced which may be recoated within a few hours. Short oil varnishes have been successfully used in some alkyd finishes to enhance water resistance and to give more complete polymerisation throughout the film. This resin has found wide employment in coatings for yachts and aeroplanes, particularly where the finish is exposed to salt water. It is also used in protective coatings for industrial machine parts, in a wide variety of situations where resistance to chemicals and oils is involved,

and in a large variety of coatings for less onerous service.

In order to show the effects of R-254 resin on chinawood oil on heating at various temperatures and in different proportions, Bakelite, Ltd., have prepared a set of

addition in retarding gelation in the varnish is quite pronounced. In using such graphs it should be borne in mind that the Browne test is based upon practically instantaneous arrival at the designated temperature. Where a gradual approach to the tempera-

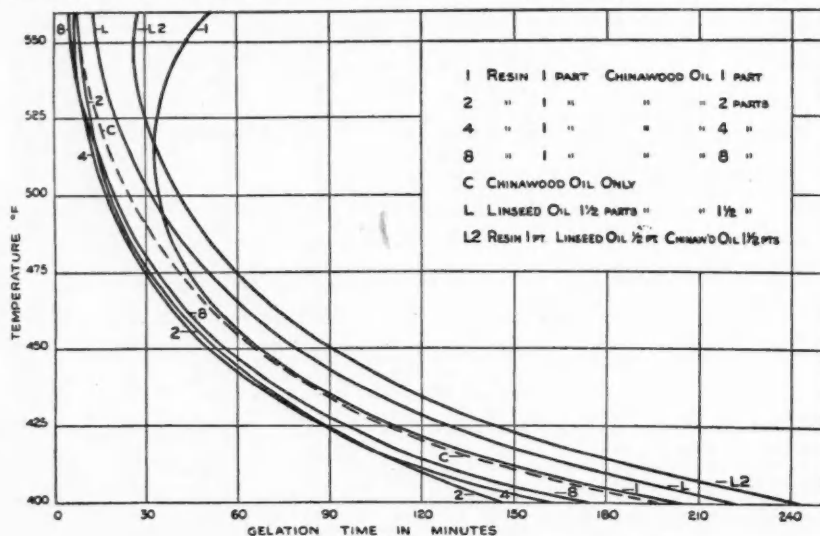


Fig. 1.

curves (Fig. 1) to assist in choosing a correct cooking procedure for any specific oil-resin mix. These curves show a modification of the Browne gelation test in minutes (A.S.T.M. D12-25T) at various temperatures for straight chinawood oil, and for a 75 per cent. chinawood oil/25 per cent. linseed oil mix, as well as for various oil-R-254 proportions. Such data may be used where variations in procedure are desired. The values represent time required for final solidification, and experience has shown that not more than one-fourth of this time is all that is desirable to produce a satisfactory varnish with these resins. The varnishes are so quickly gas-proofed that 15 mins. at 450° F. is ample to make a safe varnish of any oil length up to 4:1.

In general, it has been found that better chemical and weather resistance are produced if the resin is heated with an equal weight of chinawood oil before the main body of the chinawood oil is added. If linseed oil is used, it is preferable that it be included in this preliminary cook. The lines marked L and L2 in Fig. 1 show the gelation time of chinawood 75 per cent. linseed 25 per cent. oil mixture with R-254 resin in the proportion of a 2:1 oil length varnish. The value of the linseed oil

ture is produced, as in the varnish kettle, the rate of gelation is approximately doubled for every 25° F. increase. Integration of the time-rate values shows that for an increase of 10° F. per min. the time taken in reaching any given temperature (say 560° F.) is equivalent to very nearly five times at that temperature, so that five minutes should be deducted from the total gelation time shown to give the remaining allowable time (if the temperature rise is at the rate of 10° per min.). It is apparent, therefore, that the high temperatures often used in varnish cooking are not suitable for use with these resins in straight chinawood oil. The addition of linseed oil, however, has a retarding effect, which has been successfully utilised for carrying cooks to 560° F. for immediate checking with raw chinawood oil. Such procedure permits of only narrow latitude in the cooking schedule, but it is desirable for certain applications, such as marine coatings, which are subject to great and rapid temperature changes. In general, best results may be obtained by using a maximum cooking temperature of 400° to 450° F.

Another resin much used for chemically-resistant finishes is Bakelite R-10825, which



is a pale 100 per cent. phenolic product. Unlike the Bakelite R-254 resin—which has a tendency to produce a yellow colour when in varnish films on exposure—films from varnishes made up with R-10825 do not show any appreciable after-yellowing, but at the same time the latter have a high resistance to chemical action, water and weathering. The principal applications of this resin are: reaction with ester gums, etc., to produce a hard resin; preparation of durable long or short oil air-drying varnishes and stoving enamels where good colour retention is necessary; making of acid- and alkali-resisting air-drying finishes; and marine varnishes and enamels. This resin is entirely soluble in drying oils, being both heat- and oil-reactive, and it greatly increases the drying speed of chinawood oil. While it does not increase the drying rate of linseed oil appreciably, it reacts with this oil to give a higher gloss. Its physical properties are as follows: Sp. gr., 1.09; acid value, 60 to 75 mg. KOH/gm.; m.p., 80 to 95 C.; colour, not darker than 3 Gardner Holdt (1:1 solution in toluol).

Although the m.p. of this resin is between 80° and 95° C., when it is heated alone or with ester gum the m.p. is rapidly increased. When heated in the presence of oils, thermo-hardening occurs, and the reaction is characterised by visible foaming at about 118° C. At 210° to 225° C. further foaming occurs, the rate at which this further condensation takes place depending on temperature and reaction time. In com-

binations of this resin with natural resins and ester gums, the heat reactivity of R-10825 is of special value, the m.p., viscosity, and resistance value of ester gums being enhanced by such treatment. For example, if 100 parts of ester gum are heated to 200° C. (in approximately 10 mins.) and 20 parts of R-10825 added (taking 5 to 10 mins. for the addition), and the tempera-

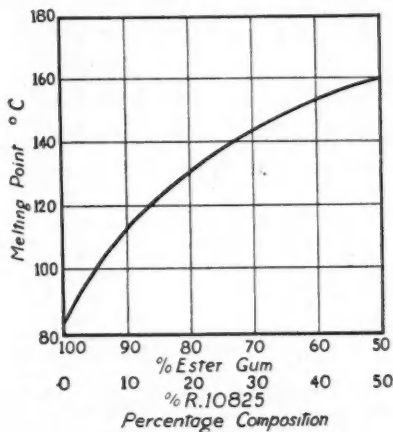


Fig. 2. Melting point of Bakelite R.10825 with ester.

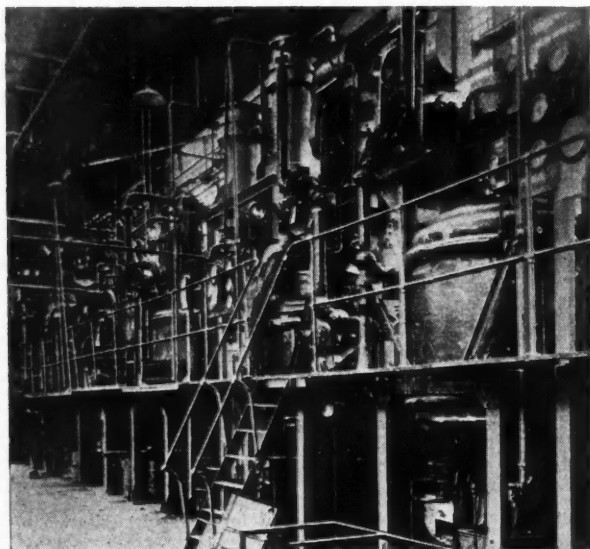


Fig. 3. Batteries of resin stills at the Bakelite factory.

ture raised to 250° C. within a further 10 mins. and held for 20 mins., the m.p. of the final resin combination will be increased to approximately 125° C., which may be seen from an examination of the graph (Fig. 2). A typical example of a varnish cook is the following:

R-10825	100 parts by weight
Chinawood oil	250 " " "
Linseed stand oil	100 " " "
Turpentine	75 " " "
White Spirit	225 " " "
Soligen lead cobalt drier	2 " " "

The chinawood oil is heated to 200° C., the resin slowly added and dissolved at 175° C. in about 10 mins. The temperature is raised to 265° C. in 25 mins. At about 200°-210° C. some foaming takes place. Linseed stand oil is added, the temperature is raised to 225° C. and the mix is bodied at this temperature to a 5-in. string, which takes about 5 mins. It is then cooled, thinned, and the driers are added in solution. The varnish dries hard and is gas proof.

Fig. 3 depicts a section of the synthetic resin bays in the Tyseley factory of Bakelite, Ltd., showing the batteries of resin stills in which the above resins are produced; a finished piece of Bakelite resin is shown in Fig. 4.

### Products for Damp Surfaces

Synthetic preparations which dry well under adverse atmospheric conditions of low temperature and high humidity represent another valuable addition to the range of modern finishes. Examples of these are the "Epok" products, R.996/40 and R.997/30, produced by British Resin Products, Ltd. These two materials are oil-modified phenolic resins, supplied as solutions in solvent naphtha. They have sp. gr. ranging between 0.905 and 0.920; viscosities, at 25° C., between 3 and 10 poises; and a solids content of approximately 40 per cent. These products are very highly polymerised resin solutions and dry principally by evaporation of solvent from the film. There is little tendency for the dried film to oxidise, but some further polymerisation on ageing is probable, as the film shows progressive improvement in its resistance to softening by hydrocarbon solvents. When diluted with solvent naphtha or xylol to normal brushing consistency, films of both resins dry in 10 to 15 mins. and are hard dry in 30 to 35 mins. Because of its greater oil length, R.997/40 produces films which are slightly softer and more flexible than those obtainable with R.996/40. The addition of cobalt, lead or manganese driers is unnecessary, for their only effect is to promote premature ageing.

Although both these resins are oil-modified, they will not tolerate additions of raw

or heat-bodied drying oils. They have limited compatibility with blown oils, but even small additions of these oils greatly retard the drying of films of the resins and, therefore, are not recommended. Both these products can be used to toughen and plasticise other resins which are soluble in xylol or solvent naphtha; and despite their highly polymerised nature, they show no tendency to react with basic pigments, such as zinc oxide or white lead, or to gell when pigmented with carbon black. They dry well under adverse atmospheric conditions and are well suited for use in finishes which may have to be applied to surfaces which are damp or subject to heavy water-vapour condensation.

The good adhesion to metals of these films, and their stability towards the common corrosion inhibiting pigments, make them useful components of anti-corrosion primers. Because of their low solids content and subdued gloss, media based on these resins are better suited for the production of matt and semi-gloss finishes than for high-gloss paints. In general, flat wall paints and undercoats require much less pigment on R.996/40 or R.997/40, with consequent saving in both raw material and labour cost to the manufacturer. They apply easily, flow well, do not "shear" on joining up, and dry quickly to a hard flexible finish. The same type of paint used in industrial finishing can be dried by stoving for 10 to 15 mins. at 120° to 150° F. Their "build" when applied to highly absorbent surfaces is an asset in the formulation of sealer primers for asbestos sheeting and plaster board. In this field, too, speed of drying is an important advantage.

### Insulating Varnish

In recent years resins and polymers have been prepared from cashew nut shell liquid (C.N.S.L.), a product of India and other countries, and this liquid probably represents up to the present time the chief economic source of a naturally occurring phenol. Cashew nut shell liquid, according to U.S.P. 2,306,077, may be chlorinated to a resinous or rubber-like product. In the presence of alkali it may be treated with an inorganic hydrocarbon ester to give mixed ether-esters, which latter, on being subjected to destructive distillation, may yield residues condensable with aldehydes.

U.S.P. 2,317,611 deals with the condensation of C.N.S.L. with phenols to yield biologically active intermediates which can be treated with aldehydes to form oil-soluble resins. In the condensation of C.N.S.L. with formaldehyde, new types of catalyst have been proposed, and new methods evolved for the polymerisation of the liquid to liquid polymers capable of further polymerisation, with or without



aldehyde, in the preparation of a product suitable for electrical insulation.

In this country C.N.S.L. has been exploited by British Resin Products, Ltd., who produce, among other products from C.N.S.L., "Epok" H.512 resin, which is extensively used in the preparation of insulating varnish. This resin is normally supplied by the makers in the form of solutions, as follows: 60 per cent. solution in white spirit; 70 per cent. solution in xylol; 60 per cent. solution in pool rubber solvent. This resin is compatible with a wide range of film-forming materials, including drying oils, coumarone resin, urea lacquer resin, xylene resins, ethyl cellulose, chlorinated rubber, Formvar, alkyd resins, "Epok" plasticiser A.461, dibutyl phthalate, tricresyl phosphate, and chlorinated diphenyl. H.512 has high solubility in aromatic and paraffinic hydrocarbons and chlorinated hydrocarbon solvents, and is soluble to a high degree in many other solvents, including esters and higher alcohols. Although the resin solutions gel in one hour at 150° C., the resin itself requires a minimum of 2½ hours at 150° C. to effect complete hardening, while correspondingly longer times are required to cure completely at lower temperatures. The following schedule was obtained by the makers of the resin by stoving

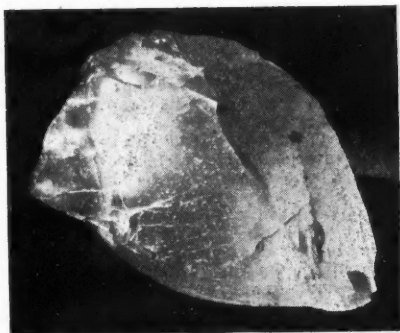


Fig. 4. A finished piece of Bakelite resin.

10 grams of the solution in a 3-in. dia. petri dish:

Temperature C.	100°	110°	120°	130°	140°	150°
Gel time (hrs.)	—	—	5	2½	1½	1
Curing time (hrs.)	60	30	15	8	4½	2½

#### Properties of the Cured Film

Cured films of H.512 show physical properties intermediate between those of the thermohardening phenolic resins and of the medium length oleo-resinous varnishes. They are tough, flexible, and resistant to mechanical and thermal shock. The resistance of cured H.512 to acids, alkalis, solvents and oils is unique among organic coating materials. Films are intact after 30 days' immersion in chemicals and solvents such as: 10 per cent. hydrochloric acid, battery sulphuric acid, waste nitrating acid, 30 per cent. caustic soda, acetone, butanol, Cellosolve, butyl acetate, petrol, and hot transformer oil. This resin is, however, slightly attacked by benzene and carbon tetrachloride. Its dielectric strength is high and compares favourably with that of good quality oleo-resinous insulating varnish films.

#### Good Penetration

Being soluble in the aliphatic petroleum solvents and hardened by polymerisation instead of oxidation, this resin possesses properties which make it superior to the oleo-resinous types as a basis for insulating varnish. Its physical and chemical properties are favourable for this application. Compared with oleo-resinous varnishes used for oil impregnation, varnishes based on this resin have, in general, good penetration into the closest windings. They harden without bubbling or blistering, and show excellent bridging and bonding properties. Such varnishes will not soften or throw out of high speed armatures, are resistant to

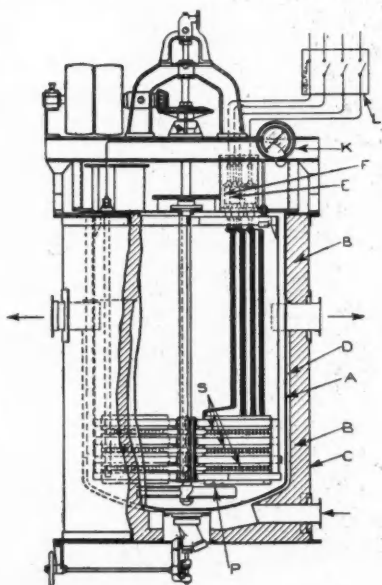


Fig. 5. Kestner Isoelectric plant.

hot transformer oil, and protect the windings against the corrosive action of acid vapours and other chemicals. The resin alone can be diluted to a suitable viscosity for use as an insulating varnish, or it can be used in conjunction with other resins and oils which will modify its properties in a variety of ways.

Some of these modifications have proved to be of considerable interest. Varnishes based on these cashew resins have applications in most types of electrical insulation, since they have good penetration into the closest windings, curing properties in thick films and good mechanical and electrical properties when fully cured. These excellent advantages are not confined to varnishes based on cashew resins alone, but are shown by all suitably formulated oleo-resinous and black insulating varnishes to which a sufficiency of one of the cashew resins has been added.

#### Alkyd Resins

In the preparation of alkyd resins maleic anhydride plays a major role, while rosin is largely used in conjunction with this anhydride. Maleic anhydride was for some

considerable time one of the few alkyd raw materials which combined both ethylenic unsaturation and condensation functionality in the molecule, but more recently alternative polymerisable and polymeric acids and alcohols have become available. Both pentaerythritol and polymerised glycerol are used in alkyd resinifications; while various types of modified alkyd resins are produced, such as by the incorporation of resins of the phenolic class with the alkyd type. Well established types of alkyd resins include maleic anhydride esters of glycerol, which may be produced by heating maleic anhydride with suitable glycerides, such as linseed oil, after which the product is esterified with a polyhydric alcohol to produce a resin which will form hard films on stoving.

#### Resin Plant

The increasing demand for synthetic resins and for varnishes, etc., which contain them has naturally been accompanied by large-scale production, and the plants recently put into service for this purpose are worthy of note. A typical example of such modern plant is the Isoelectric plant of

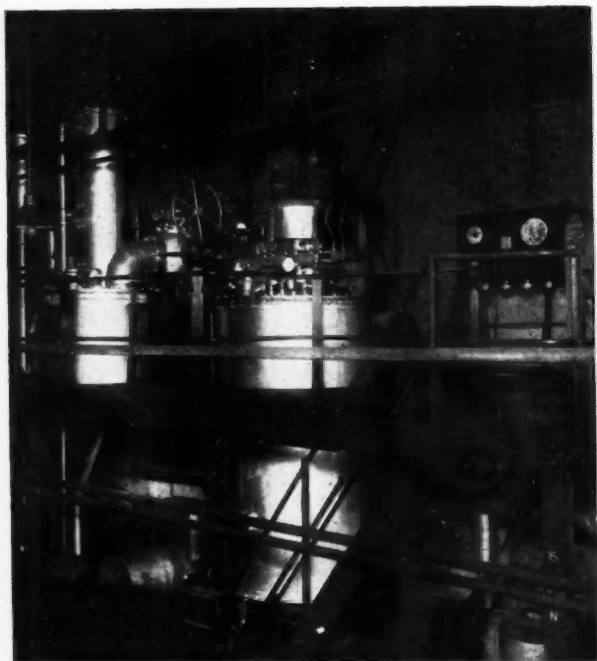


Fig. 6. A Kestner Isoelectric alkyd resin plant.

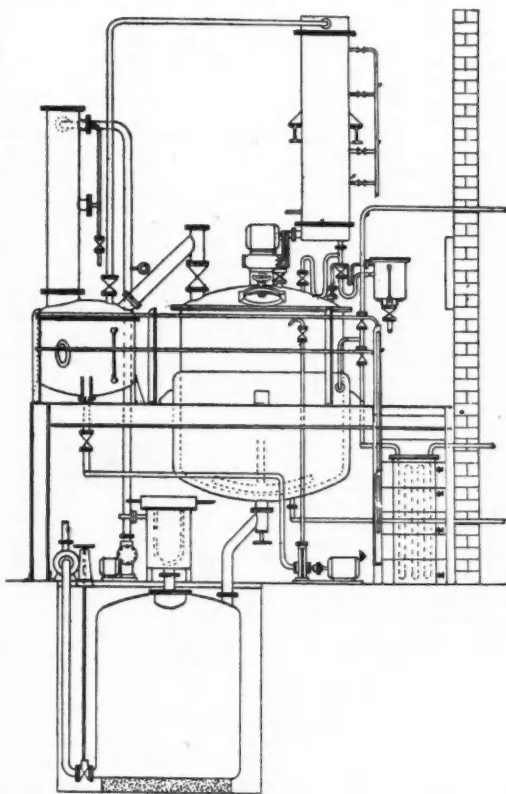
Kestner Evaporator & Engineering Co., Ltd., which is outlined in Fig. 5. In this system use is made of direct electric elements immersed in the fluid. The metal of which the elements are constructed is selected in each case not only for its electrical properties, but to suit the material being dealt with. Previously, oil and varnish pots have been heated direct by means of gas, oil or solid fuel. Either gas or oil can be thermostatically controlled better than solid fuels, but they have the great disadvantage, in general, of a tendency to overheat the product. The metal pot or vessel must come into direct contact with the products of combustion, and as a result, local overheating of the material may take place, while the bottom of the vessel sooner or later burns out.

These difficulties are avoided by placing the heat inside the vessel itself and within the material to be heated. Fig. 5 shows the electric elements for heating by three-phase current. The terminal box E is fitted with connections for three-phase with

The principle of generating heat inside the kettle in direct contact with the product has a high efficiency and under normal works conditions at least 95 per cent. efficiency is obtained. The power consumption naturally varies with size of batch, bodying temperature, bodying time, etc., but is usually between 0.9 and 1.2 units per gal. of product. Taking a conservative figure of  $\frac{3}{4}$ d. per unit, the cost works out at roughly 0.6d. to 0.9d. per gal. Another type of plant for handling synthetic resins and their

**Fig. 7. Diagrammatic sketch of "Diamond" reaction kettle and auxiliary plant.**

neutral at F. The elements in this instance are in strip form, arranged spirally, and superimposed one on the other as shown at S, which disposition ensures that thermic circulation causes most intense movement of the liquid in the vessel. Being on edge vertically, the strip provides the maximum surface for heating, yet the minimum resistance to flow of liquid in the upward and downward directions. The arrangement gives the necessary speed to the liquid over the surface and maintains an efficient circulatory system. Fig. 6 depicts a plant of this type installed in a varnish works. It is a Kestner alkyd resin plant with special vacuum condensing system. In such plants the temperature of the metal strip forming the heating elements is very much lower than that of the walls of an externally heated kettle, being only about 100° hotter than the product itself. The running cost of these plants, so far as heating is concerned, compares favourably with that of plants heated by other methods.



varnishes, by The London Aluminium Co., Ltd., is outlined in Fig. 7. This plant comprises an indirect-heated reaction kettle, stirring equipment, condenser, pumps, solvent mixing vat, etc., and may be constructed in mild steel, stainless steel, copper, nickel, aluminium, or light alloy.

In plants of this description the choice of the most suitable metals, methods of fabricating and particularly the use of the correct technique in welding are of the greatest

importance towards withstanding the corrosive action of the reaction mixtures and thus yielding products of the highest quality. The use of fluid heating mediums, *e.g.*, circulating hot oil and diphenyl, leads to easy control of temperature, evenness of heating and rate of heating. The choice of heating method has to be made after a study of the various factors, such as installation costs, running costs, temperature range required, and grade of product desired.

### Heat-Resistant Resins

For varnish making purposes the technological basis of phenolformaldehyde resins is concerned largely with the alkylated and arylated classes. Among the newer types of product may be noted the production of flame-resistant materials by an American process (U.S. Pat. 2,298,866), wherein phenols are condensed with chlorinated alkyl phosphates. Bakelite resin R.10840 is an example of a 100 per cent. phenolic resin of the non-heat-reactive type and manufactured from British raw materials. It has the following physical properties: sp. gr. 1.17; m.p. 112-125°C.; colour (1:1 solution in toluol), not darker than No. 8 Gardner-Holdt. It lends itself readily to the production of oil varnishes with such oils as tung, linseed, etc. In admixture with tung oil it has good low-temperature gas-proofing properties and its slight gelation-retarding effect facilitates control in the varnish kettle.

A certain amount of initial cloudiness is apparent when the resin and tung oil are heated together, but this clears rapidly when the temperature reaches 230° to 240° C. These oil varnishes will air-dry overnight to give tack-free films. The addition of this resin greatly improves the resistance of linseed oil to water and solvents, but the air-dried films of its linseed oil varnishes tend to suffer from a very slight after-tack. This tendency to after-tack can be eliminated by adding about 25 per cent. of a quick-drying tung oil varnish.

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## New Synthetic Fibre

### An All-British Discovery

**I**MPERIAL Chemical Industries and the Calico Printers' Association announce that a new truly synthetic textile fibre is now under investigation in I.C.I.'s laboratories. The advent of this new fibre, produced from a polyester derived essentially from terephthalic acid and ethylene glycol, marks another step in the application of fundamental scientific research to the controlled design of textile raw materials. The fibre, which is at present known as "Terylene," is the result of research work initiated by the Calico Printers' Association, and

carried out in their laboratories by Mr. J. R. Whinfield, assisted by Dr. J. T. Dickson and others. The qualities of the polyester, and its potential value for fibre-making, were recognised by the C.P.A., and patents covering the inventions were taken out by them. The subsequent research work on the chemical polymer and its conversion into a textile fibre has been entrusted to I.C.I., who have acquired an exclusive licence covering the whole world outside U.S.A. It is a wholly British fibre.

"Terylene," it is hoped, will add to the range of attractive new textile materials. From a given sample of the parent polymer it is possible to produce multifilament yarns of widely different characteristics by varying the physical and mechanical operations of spinning and processing. Thus, for example, it is possible to obtain from the same polymer a yarn of low extensibility, but with outstanding high strength (eight grams per denier or higher), or one of increased extensibility, but with a lower strength.

### Good Heat Resistance

Probably the most notable property of "Terylene" so far observed is its markedly high resistance to light and to heat. Another outstanding property is its high initial elastic modulus, so that a relatively high load is required to produce a small extension. This should permit "Terylene" to be readily woven or knitted. Like other fully synthetic fibres, "Terylene" is highly resistant to micro-organisms and bacteria. The general chemical resistance is good, particularly to acids and organic solvents and bleaching agents. It has a very low moisture absorption and does not swell in water. It can be heat-set to give stable yarns or fabrics, has good resilience and a high ratio of wet to dry strength. "Terylene" fabrics can be ironed, laundered and steam-pressed normally. The fibre presents problems in dyeing, and research on coloration is proceeding. Exceedingly fine filaments can be made, as well as heavy coarse filaments, giving a wide potential range in texture and types of fabrics. It can be expected that, later, "Terylene" will also be available in forms other than fibres such as monofil, film, extruded sections, and moulding powders.

### Difficulties of Production

So far the development is in a preliminary stage in the laboratory, and it is here that these applications are being explored. Nevertheless, with the present difficulties in the supply of essential equipment and buildings, which are retarding all developments, it must inevitably be a matter of years rather than months before the final stage of evaluation is reached and the fibre is available to the textile industry in appreciable quantities.

# Leather Chemists in Conference

## Papers Read at the Leeds Meeting

THE annual general meeting of the British Section of the International Society of Leather Trades Chemists was held in the University, Leeds, on September 20-21. The president, Mr. F. H. Quinn, M.Sc., in opening the meeting, welcomed Professor P. Chambard, president of the Society, also Messrs. C. R. Loos, C. Monnet, S. G. Govier, Professor E. R. Theis, Mr. T. C. Thorstensen and others. He referred to the steady and continuous growth of the section, and said he was hoping eventually for an even wider degree of co-operation with other leather chemists' organisations.

A paper on "The Influence of Acids and Salts on the Properties of Sole Leather," by N. L. Holmes and G. E. Benskin, was read by Mr. Benskin. It dealt with investigations of the effects of varying salt concentrations and effective acidities in the region of those commonly found in practice on leather tanned in mimosa liquors. The properties examined included tensile strength, elastic modulus or rigidity, shrinkage temperature, substance changes of the wet leather and weight yield. Graphs and tables indicated that the salt concentration of liquors was as important to the control chemist as were tan contents and pH determinations.

Under the conditions obtaining for these experiments it was found possible to assess the relative effects of changes of pH and salt concentration on these properties. A difference in magnitude as small as 0.05 N. in the salt concentration was shown to have a profound effect on the wet rigidity of leather at pH values in the region of 3.0. The results of hot pitting leather under differing conditions of salt content and acidity were studied and the effect of salt concentrations was shown to be greater at 37° C. than at 16° C.

### Connective Tissues

Dr. E. C. Bate-Smith's paper, which followed, was entitled "The Chemistry of Connective Tissue." From a chemist's point of view, he said, animal tissues presented a bewildering assembly of chemical substances, out of which some degree of order was gradually emerging. The connective tissues, by comparison with other tissues, such as muscle, had had little attention paid to them as yet, and the phase of preliminary sorting had not yet been completed. One rested at present on the histologist's tests for the differentiation of characteristic components, and the immediate task was to fill in the chemical details of this differentiation.

The histologist recognised three, and only three, fibrous components of the various categories of connective tissue: collagenous,

elastic, and reticular. These were differentiated by morphological characters, e.g., whether branched or unbranched, wavy or straight, and by staining reactions with various dyes or impregnating procedures, sometimes of a very complicated character. Chemical characterisation in an approximate sense had been achieved by examining tissues in which these components predominate, and from which extraneous matter, such as the ever-present amorphous ground substance, had been cleared as much as possible.

The connective tissues contained a great deal of material other than the substances of the fibres. The most important other protein constituent was a mucoid, variously termed tendomucoid, chondromucoid, etc., but which appeared to be the same from all types of connective tissue. This was probably the material of the amorphous ground substance, which was so elusive a component from the histological point of view. Further progress in the chemical characterisation of these constituents, especially the fibrous ones, needed in the first place the most meticulous separation of the recognised structural elements, resorting if necessary to microdissection for the purpose, and this may require the development of ultramicrochemical analytical methods to deal with the small quantities of material so obtained.

### Salts of Chromium

"The Complex Salts of Chromium" were dealt with in a contribution by E. R. Theis and T. C. Thorstensen (read by Professor Theis). In this it was pointed out that the addition of oxalic acid to 33 per cent. basic chromium sulphate resulted in a strong penetration of the complex by oxalic acid or the oxalate anion. Spectrophotometric extinction curves showed two maximum absorption peaks in the near ultraviolet and visible portions of the spectrum. The spectral absorption was greater at 720 m $\mu$  than at 560 m $\mu$ . In both peaks there was a slight shift towards lower wave-lengths with increased addition of oxalic acid. The addition of formic acid resulted in a spectral curve having a higher absorption at 580 m $\mu$  than at 720 m $\mu$ , just the opposite of the oxalic acid complexes. It was also noted that the extinction values of the complex decreased with small additions of formic acid until a minimum value was reached. With further addition of formic acid, the extinction values increased slowly but steadily. Preliminary data has shown that cationic exchange resins can be used as an analytic tool for the study of various types of chromium complexes. The data given in-

dictated that the "formato"-chromium complexes are quite different from the "oxalato" complexes. These data indicated that formic acid in the molecular state penetrated the complex, while oxalic acid appeared to enter as the anion. The practical concept of moderate additions of sodium formate to chrome liquors was studied and discussed. It was stated that the addition of three moles of formate for each mole of  $\text{Cr}_2\text{O}_3$  used will yield a finished leather having a smooth grain, a full and round leather, and possibly an increased yield.

### Grease in Light Leather

The problem of grease in light leather manufacture was discussed by Dr. K. G. A. Pankhurst. It was satisfactorily solved only if dealt with at a very early stage in the leather-making process. Failure to deal with it in the pre-tanning period could not, with certainty, be remedied by a post-tanning treatment with petrol. Three main methods of pre-tanning degreasing were available, viz.: solvent extraction, aqueous emulsification, and pressure. The last process needed little explanation; solvent extraction and aqueous emulsification, however, involved many surface chemical actions which made their application more complex.

A necessary preliminary to degreasing was the rupture of the walls of the cells in which the fat is normally invested. This was usually accomplished by pickling and subsequent storage. Pickling also brought about the very necessary conversion of any calcium soaps, formed during any previous liming treatment, into removable free fatty acids.

Solvent extraction of pickled pelts (about 60 per cent. water) could be divided into three stages: (1) entry of the solvent into the pelt, displacing the water in contact with the fibres; (2) dissolution of the fat in the solvent and its diffusion out of the pelt; and (3) replacement of the solvent and residual dissolved fat by an aqueous solution. Stages (1) and (3) were mutually antagonistic, since any surface-active agent added to the solvent to bring about its entry into the pelt would militate against its subsequent replacement by an aqueous solution. The most satisfactory surface-active agent to use was one which, having assisted in stage (1), is hydrolysed by the acid of the pickle during stage (2) to form a compound with little or no affinity for the protein fibres of the skin. Sulphated amyl oleate is such a compound.

Degreasing by aqueous emulsification was best brought about by the use of non-ionic surface-active agents, which were much less absorbed to the protein fibres than either of the two ionic types. Compounds such as condensates of ethylene oxide with long-chain molecules, e.g., alcohols, were suitable. Vigorous mechanical action throughout any

degreasing treatment was an essential to its success.

"Enzymes in the Pyrogallol Tannins," contributed by Dr. S. D. Sourlangas, was the concluding paper. Here it was shown that the deposition of bloom from pyrogallol tannin infusion was brought about through the hydrolysis of the tannins by an enzyme or enzymes native to the fruit themselves. These enzymes could be inactivated by damp-preheating of the fruits or by lowering the pH of the solutions to the region of pH 2.3. The valonia enzyme could be absorbed on to kaolin under specified conditions, and would also come off the kaolin into a tannin solution of pH 4.5, but **not in any of the buffers tried.**

It had been found possible to separate the enzyme from the various pyrogallol tannins, and their hydrolytic activity had been tested on some of the more common tannins of the same class, as well as on gallotannic acid. "Tannase" produced bloom not only from a heat-sterile valonia solution, but also from a valonia infusion which had ceased to deposit bloom. The exact mechanism of bloom deposition was discussed in some detail, and various suggestions put forward in the past were critically examined.

The quantitative determination of gallic acid by extraction with ether in a Forster extractor without any previous dialysis, but after the solution had been acidified, was put forward as the most reliable method of determining gallic acid in the presence of "interfering" substances such as the tannins. All the methods previously suggested were found to be of no great value, as the gallic acid was adsorbed together with the tannin on substances like hide powder, quinine hydrochloride, or gelatin.

The general properties of ellagic and chebulinic acids were discussed and the work of Freudenberg and Goldman on the titration curves of the latter acid was described, indicating that chebulinic acid possessed two free carboxyl groups.

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### BRITISH GUIANA TRADE

Big increases in the imports and exports of British Guiana for the six months ended July 31, 1946, compared with the similar period last year, is indicated in the *Commercial Review of British Guiana*. Imports of ammonium sulphate from Great Britain increased from 5,040 tons to 6,628 tons; cement from 12,584 barrels to 23,155; oil from 145,074 gal. to 249,458; while glass and glassware imports were \$91,645 against \$89,058 in 1945, and painters' colours and materials \$146,003 against \$144,226. Balata, gums, charcoal, gold and diamonds showed increased exports, while molasses increased from 176,750 gal. in 1945 to 1,889,282 gal. this year.



# Institute of Welding

## Expansion of Scope and Activities

**I**N his presidential address, delivered at a meeting of the Institute of Welding in London on October 2, Mr. Arthur Dyson referred to the high standard set by the past president, Mr. W. W. Watt, and the progress which the Institute had made in the past two years under his forceful and far-sighted leadership.

In that period membership had increased from 3252 to 5115; in 1943/44, the Institute's income was £4854 and the year closed with a deficit of £241; last year there was a surplus of £769 and the total revenue was £9541. In 1943/44 the Council and its principal committees met nine times, as against 24 last year. When Mr. Watt became president there were 11 branches; there are now 19, and last year there were 142 meetings organised by the Institute and its branches, as compared with 100 in 1943-44. Furthermore, under Mr. Watt's guidance the Welding Research Council was transformed into the British Welding Research Association, and the whole constitution of the Institute recast and reconstructed.

Issues of the Transactions of the Institute had been increased from three or four to six a year, as the first step towards giving the Institute something it had never yet had, a monthly journal of its own. Last, but by no means least, the regulations regarding membership had been entirely revised, so as to give every class of membership a known and enhanced technical significance.

### Outlook for Welding

"It must," he continued, "be our constant aim to devise means of associating with the Institute's work in all its variety the largest possible number of members. The outlook for welding in this country is a very bright one, for I cannot believe that, in spite of the astonishing progress made during the war, we have as yet come within sight of exhausting the possibilities for the employment of the various welding processes. It is a commonplace that the whole world is crying out for goods of all descriptions. It is equally obvious that British industry must maintain the same high level of production which it achieved in the war years. There is still much to be told about the part which welding played in making possible that war-time achievement, and we can confidently expect that welding will be called upon to contribute more and more to the manufacture of everything made of metal—and even, as some of our members remind us occasionally, of things made of plastics!

If we are to attain the same sort of standing as the older institutions, the several grades of our membership must stand for definite and ascertainable degrees of technical and scientific accomplishment. I hope that during my year of office the scheme for an Associate-Membership examination will be completed and approved. A suitable examination scheme can hardly fail to set up a standard of technical education with regard to welding of which every technical college in the country will have to take account.

In particular, said Mr. Dyson, they wanted to work hand-in-hand with the British Welding Research Association, for they looked to the Association for answers to numberless technical problems crying out for investigation, and they could offer to the Association unrivalled opportunities for putting the results of their researches into the possession of those who needed them.

### Catering for Craftsmen

After giving his audience an outline of the Institute's educational policy, Mr. Dyson pointed out that, unlike most other engineering institutions, they had a class of membership, the Associateship, open to craftsmen. He shared the hope that in course of time the Associateship would give status to those who held it, and would serve to guarantee their competence as craftsmen, and he welcomed the interest shown by an offer, recently received and now under consideration by the Council, to finance a special competition in practical welding, open to Associates. Another suggestion was that the Institute should sponsor a series of pamphlets or leaflets, somewhat on the lines of those issued during the war by the Advisory Service on Welding, but designed expressly to inform the practising welder.

### Library Service

Commenting on the remarkable growth of the Institute's Library, the president looked forward to the time when a Technical Information Officer, in charge of a separate department of the library, would be the guide, philosopher and friend of all who sought information about the welding processes. He asked members to assist them by undertaking to provide abstracts on subjects for which they were qualified.

In conclusion, the president reminded members that it was the Institute's part to stretch out its hands to all concerned with welding in any way, and to forge strong links with all associated bodies. The Institute had built up, and was building up, the friendliest relations with their opposite numbers in other countries.

**LETTER TO THE EDITOR****Peat Moss in Canada**

SIR,—The August 3 issue of your journal has been subject to my continued study for over two weeks. The note on peat wax and the paper by Clement and Robertson have been especially interesting to me.

Since October, 1943, I did research work at the National Research Council on the utilisation of Canadian peat, muskeg and other national fibres. I attended the first International Flower Show in New York City, after five years' omission, in March of this year, and saw the demand for peat moss in the United States.

One of the uses for peat moss not mentioned in the Clement-Robertson paper is as an addition to Buna-S rubber mixes for making cheap floor tiles, moulded sponge rubber, and several other products.

I determined the wax content in over 40 samples of peat substance from different localities; and we have decided wax extraction is not economic in Canada in the face of competing petroleum and synthetic waxes and plastics.

There are many other topics that could be discussed, but time is short and the reason for this note is to congratulate you on the good journal you are publishing and to say that I am ready at any time to co-operate with Messrs. Clement and Robertson in the exchange of information regarding respective peat ideas.—Yours faithfully,

C. W. DAVIS, B.Sc., M.C.I.C.

240 Powell Avenue,

Ottawa, Ont.

September 16.

**TIN CONFERENCE**

With the purpose of considering the prospective world tin position and whether any continuous inter-governmental study of that position is necessary, an international tin conference was opened on Tuesday in the Royal Geographical Society Hall, Kensington Gore, London, S.W. The British delegation comprised: Mr. George Archer, of the Ministry of Supply (head of the delegation); Mr. E. Melville (Colonial Office); Mr. R. L. Hall (Board of Trade); and Mr. C. T. Crowe (Foreign Office). The delegation had a panel of advisers representing the producing, smelting and consuming sides of the tin industry; these advisers were: Mr. A. G. Glenister (with Mr. G. W. Simms as his alternate); Mr. J. Ivan Spens; Mr. W. J. Wilcoxon; Mr. E. V. Pearce; Mr. S. Cahn; and Mr. P. O. Williams. The joint secretaries to the British Delegation are Mr. W. Fox (Ministry of Supply) and Mr. D. Caplan (Board of Trade).

**Hungarian Dyestuffs****New Production Programme**

A PROGRAMME for the production of 40,000 kg. of aniline dyes a month, and smaller amounts of diazo and sulphur dyes, has recently been put into operation in Hungary. Five large firms, including the Pet Fertiliser Works and the Hungaria Chemical Works, are participating in the scheme, which may subsequently be extended to include indigo substitute dyes.

Hungary has hitherto been entirely dependent on imports for her dyestuffs, a factor that has hindered the development of her cotton and silk printing industries. In 1944, dyestuffs ranked ninth of Hungary's imports, with a value of 21,300,000 pengoes, of which the I.G. Farben, supplied 18,100,000 pengoes' worth and Switzerland 3,100,000 pengoes. Since the armistice, no supplies have been received from Germany, but imports from Switzerland have increased to a value of 400,000 Swiss francs a month.

**Arsenic-Resistant Ticks****Controlled by Gammexane**

THE arsenic-resistant form of the common blue tick, which has hitherto defied all attempts at eradication, has been brought under control by Gammexane, the British insecticide. The common blue tick, which causes immense damage to cattle, especially in the Eastern Cape and Natal, acts as a carrier for gall sickness and red water. It has developed an arsenic-resistant strain during the forty years since arsenical dipping first became standard farming practice. Other insects have built up a similar defence against recognised chemical insecticides. The phenomenon was first noticed in connection with waxy scale insects on citrus trees, which built up resistance even to the strongest doses of cyanide.

Early research on the problem of the blue tick, undertaken at Rhodes University College, Grahamstown, showed that continual dipping in arsenical washes only increased the number of arsenic-resistant strains on the cattle. In a subsequent search for alternative treatment, by entomologists of African Explosives and Chemical Industries, the success of Gammexane was demonstrated. Large-scale dipping trials proved that three consecutive weekly treatments with dips containing only 50 parts of Gammexane per million rid the cattle of all lice and ticks, which dropped off in hundreds, leaving only a few "seed" ticks.

As in every instance where Gammexane has been used on domestic animals, the beasts suffered no ill effects. Oxen were spanned immediately after treatment, and there was none of the marked drop in milk yield which follows arsenical dipping.



## Personal Notes

DR. E. TABERNER has been elected president of the South African Chemical Institute.

MR. S. R. TAILBY has been appointed lecturer for the daytime course in chemical engineering at Battersea Polytechnic.

DR. D. M. WILSON has left I.C.I., Ltd. (Explosives Division), to become lecturer in chemical engineering at Birmingham University.

DR. R. A. PETERS, Whitley Professor of Biochemistry in the University of Oxford, has been appointed a member of the Medical Research Council.

MR. LEOPOLD FRIEDMAN, managing director of De La Rue Gas Development, Ltd., has been appointed a director of Thomas De La Rue & Co., Ltd.

DR. J. T. DICKSON, who helped discover the new synthetic fibre Terylene (see page 446 of this issue), has joined the staff of Imperial Chemical Industries.

MR. F. W. ARCHER and MR. J. M. KERSHAW, who have joined the chemical engineering staff of Monsanto Chemicals, Ltd., were formerly with the Admiralty and the Indian Government Service respectively.

MR. STANLEY ROBSON has been appointed to the Mineral Development Committee set up by the Minister of Fuel and Power to inquire into the resources and development of Britain's metalliferous and other minerals.

PROFESSOR R. A. PETERS, Professor of Biochemistry at Oxford, visited Belgium at the invitation of the Société de Chimie Biologique and under the auspices of the British Council, to lecture to the Congress of Biochemists which was held at Liège from October 3-6.

DR. B. A. KILBY, M.A., F.R.I.C., who has been appointed to a lectureship in biochemistry at Leeds University, has been working for the Medical Research Council for the past two years on the synthesis of penicillin with Professor A. R. Todd, at Cambridge.

SIR WILFRID AYRE, chairman of the British Shipbuilding Research Association, and director of several shipping companies, has been appointed to the vacant seat on the Iron and Steel Board. He is a younger brother of Sir Amos Ayre, who was chairman of the Hydrocarbon Oil Duties Committee.

MR. D. T. FLOOD, M.Sc., F.R.I.C., who has been appointed director of the new Institute of Industrial Research and Standards in Eire, assisted during the war in the establishment of chlorate and phosphorus plants for the Army. From 1926

to 1934 he was engaged in technical research work at Yale University, U.S.A. He also worked for a time on research work in the petroleum and rubber industries.

DR. W. J. DONALDSON, B.Sc., Ph.D., lecturer in chemistry at Constantine Technical College, Middlesbrough, has been appointed lecturer in chemistry at Robert Gordon's Technical College, Aberdeen. Graduating at Edinburgh University, he was awarded his Ph.D. degree for research on colloid and physical chemistry. He became a demonstrator at Edinburgh University and later chemistry master at the Royal High School, Edinburgh. During the war he was seconded to I.C.I.

## Obituary

DR. NORMAN LINDSAY SHELDON, Ph.D., C.I.E., F.R.I.C., who died on October 4, aged 70, at his home near High Wycombe, Bucks., had spent most of his active career in chemical industry in India. Appointed chemical engineer (1903) and manager (1915) of a Government cordite factory in India, he became Superintendent of the Acetone Factory, Nasik, in 1919, and Chief Inspector of Explosives, India, in 1920. He retired in 1932. His Fellowship of the Royal Institute of Chemistry dated from 1907, and he was elected to the Council of the Institute in 1940.

SIR FRANK HEATH, G.B.E., K.C.B., who died in London on October 5, aged 82, though not himself a scientist—he was at one time Professor of English at London University—had done as great service to British scientific industry as any of his more technological colleagues. It was through his initiative and administrative skill that the Department of Scientific and Industrial Research was established soon after the outbreak of war in 1914, and he served as its secretary from 1916 to 1927. In 1925 he visited Australia and New Zealand to strengthen the bonds between the D.S.I.R. and corresponding organisations in those Dominions, and his reports were followed by Acts of Parliament embodying his proposals. He was also a Governor of Imperial College and was a vice-chairman of the general council of the British Standards Institution (chairman 1938-9).

PROFESSOR IGNACY MOSCICKI, who died at Versoix, Switzerland, on October 2, aged 78, was best known as the president of Poland who urged his country to resist the Germans to the utmost in September, 1939. He began his career, however, as a chemist, having studied at Plock and at Warsaw before taking up an appointment in the faculty of chemistry at Riga Polytechnic in 1887. Returning to Warsaw in 1891, he incurred the suspicion of the Russian authorities for his share in the Polish movement of independence and was driven into exile.

After a period in London he migrated to Switzerland, where he worked on the chemistry of nitrogen with Professor Kowalski, at Vevey and at Fribourg University, and developed the "whirling arc" process for the production of nitric acid. In 1908 he was approached by the Aluminium Industrie A.G. of Neuhausen, and undertook the erection of a nitric acid plant and absorption towers at their new works at Chippis, effecting many improvements in subsequent years. In 1913 he became Professor of Chemistry at Lwow University (then under Austrian rule), where he

occupied himself with the chemistry of petroleum and cognate chemical engineering problems. His second nitrogen plant was erected at Bory-Jaworzno, Poland, in 1921. Even more important, perhaps, was his share in the organisation of the State Chemical Works at Chorzow, where he remained in charge until Pilsudski called him to Warsaw in 1926 to be the President of the Polish Republic. Forced to flee to Roumania in 1929, he suffered a breakdown in health and was allowed to proceed to Switzerland, where he assumed Swiss nationality.

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## General News

**Cobalt oxide**, crude or refined, may now be imported from any country without individual import licences, according to a Board of Trade announcement this week.

**Among gifts and samples** of British manufacture which Lady Cripps took with her to China when she left Dorset in a flying boat on Saturday were 10,000 M. and B. tablets which May & Baker, Ltd., provided for distribution among hospitals.

**A scientific study** of the possibilities of using lean whale meat for human food is to be made by a team of scientists who are sailing for the Antarctic this month under the auspices of the Department of Scientific and Industrial Research.

**Illustrations** to I.C.I. advertisements will be included in an exhibition which is to be held under the auspices of the Central Institution of Art and Design at the Suffolk Galleries, London, from October 18 to November 9.

**About sixty firms** exhibited at the Welsh Industries Fair at Cardiff last week. The organisers consider the fair to have been about five times as successful as the fair held in May, the total attendance having been estimated at 30,000.

**A Fuel Economy Conference** is to be held at The Hague from September 2-10 next year, arranged by the Netherlands National Committee of the World Power Conference. Intending participants are invited to apply for further particulars to the British National Committee, World Power Conference, 36 Kingsway, London, W.C.2.

**The Colonial Office** has announced the institution of Colonial Research Fellowships to encourage qualified scientists to give special attention to colonial problems and to enable them to pursue research in the British colonial empire. Application forms and full information are obtainable from the secretary, Colonial Research Committee, Palace Chambers, Bridge Street, London, S.W.1.

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## From Week to Week

**Platinum** is stated to have been sold this week at £22 per troy ounce by a leading London metal dealer; this is a fall of £1 5s. from the previous level of £23s. 5s. maintained on the London Metal Exchange.

**More than twenty resolutions**, covering numerous aspects of trade and commerce, will be discussed at the autumn conference of the National Chamber of Trade at the Assembly Hall, Tunbridge Wells, on October 23-24.

**A strike** of about 400 employees of J. and J. White, Ltd., Shawfield Chemical Works, Glasgow, followed the dismissal by the management of men declared to be redundant, and including furnacemen. It is intended to carry through a reorganisation scheme in the furnace department involving the disposal of some 80 workers.

**The Performing Right Society, Ltd.**, 33 Margaret Street, London, W.1, points out that owners of factories and canteens should obtain from the society without delay the licence now necessary if "Music While You Work" and other copyright music is to be enjoyed without danger of infringement of copyright or liability to legal proceedings.

**The current issue** of "600," house journal of George Cohen, Sons & Co., Ltd., and associated companies, contains not only the customary house news and pungent humour (including quite a good joke against the modern chemist), but also some remarkable photographs, among which is a reproduction of the remarkable Kodak photomicrograph of a hexamethylbenzene molecule.

**Almost half** the available factory space in Short's premises at Rochester has been allocated by the Board of Trade to three firms: B. & P. Swift, Ltd., (automatic scales, gears, hydraulic pumps); Elliott Bros. (London), Ltd. (electrical and mechanical precision instruments); C.A.V., Ltd. (fuel injection pumps, electrical equipment).

**Trade buyers** attending the "Britain Can Make It" Exhibition at the Victoria and Albert Museum, South Kensington, London, need no longer wait in queues with the public to gain admission, but can obtain priority admission between 9.15 and 10 a.m. daily on presentation of their trade card at the inquiry desk at the Exhibition Road entrance to the museum.

**A £500,000 development scheme** has been undertaken by the Alloa Glass Work Co., Ltd., Alloa, Clackmannanshire, which specialises in glass containers of all kinds. All the company's furnaces are to be re-designed on a new and enlarged scale and modern glassmaking machinery from America is being introduced. The first shop should be completed in ten months' time and the whole project should be finished by 1950—the 200th anniversary of the glass industry in Alloa.

### Foreign News

**Newfoundland's iron-ore production** amounted to 984,645 tons last year, as compared with 464,371 tons in 1944.

**Russia and Sweden** have concluded a trade agreement, details of which will be made known later.

**The 125th anniversary** of the founding of McGill University, Montreal, was celebrated on Saturday.

**Sierra Leone produced 705 tons** of chromite in the second quarter of this year. No chromite was mined in the corresponding quarter of 1945.

**Thirty-two new members** were elected to the Chemical, Metallurgical and Mining Society of South Africa during the year ended June 30 last.

**The completion**, in January of last year, of a vanadium extraction plant in Peru, has resulted in a 20 per cent. increase in vanadium output in 1945.

**The Siamese Government** has notified the U.S. State Department that it would welcome the participation of American capital in the development of the country's mineral wealth.

**We have just received** the first two issues (July and August, 1946) of a new Review of Metallurgy—*Hutnické Listy*—published at Brno, Czechoslovakia. Accompanying the original articles are brief summaries in Russian, English, and French.

**It is estimated** that output of metals in the Belgian Congo this year will not reach last year's level. Copper production is expected to total about 130,000 tons, against over 160,000 tons last year; and tin output is estimated at 15,000 tons, compared with 17,350 tons in 1945. Output of tungsten might, however, show a small increase.

**Canadian and United States interests** are reported to have opened negotiations regarding the establishment of a zinc refinery in Quebec.

**Negotiations are reported** to have been concluded in Buenos Aires for the purchase, by the United States, of approximately 30,000 tons of linseed oil, at a price at least 10c. a lb. over the present American ceiling price of 27-28c.

**A crisis has recently developed** in the Sicilian sulphur mining industry, due, in the main, to a decline in sales. Because of financial difficulties, the "Imera" concern, which operates the two important mines at Trabia and Tallarita, has suspended work.

**Under the terms** of a new trade agreement between Switzerland and Yugoslavia, Swiss chemical and pharmaceutical products, as well as dyestuffs, machinery and apparatus, will be exchanged against ores, timber and other raw materials.

**Pre-war plans** for the establishment of hydrogenation plants are again being discussed in the Belgian coal mining industry, especially by enterprises in the Charleroi region. Should these plans materialise, it is expected that a number of basic chemical products will be manufactured.

**Experiments on underground gasification** of coal are being carried on at the Bois-la-Dame collieries in the Campine coalfield of Belgium. Depending on the result of these, a programme will be drawn up for the whole of the Belgian coal-measures, in accordance with the geological conditions obtaining.

**A trade agreement** between Austria and Poland, in force for the next six months, provides for an exchange of goods to the value of \$7,200,000: Poland will mainly export coal, zinc, and other mineral products, while Austria will deliver metallurgical machinery.

**Recent prospecting for gypsum** in France—as a raw material for sulphur production—has revealed two rich deposits in Provence, says *L'Industrie Chimique*, the calcium sulphate being present in its anhydrous form, much the most suitable for the purpose required. One deposit is in the Buëch valley, tributary to the Durance; the other is located in the Var, between Toulon and Brignoles.

**Production of aluminium** at the new Norwegian works at Aardel will not begin before the second half of next year. The works were planned and built by the Germans at a cost of Kr.200,000,000, and it is estimated that production costs will amount to Kr.1427 per ton. Annual output will aggregate about 12,000 tons per annum, thus bringing the country's aluminium output up to about 50,000,000 tons per annum.

According to a Swiss report, a British industrialist is negotiating with the Danish Ministry of Industry on the erection of a large steel plant near Copenhagen. The required capital of about 120,000,000 Kroner is to be raised jointly by Swiss and British interests. A weekly output of 300 tons is envisaged, and the works should provide employment for some 500 men.

Canadian exports of chemicals and allied products for the first seven months of this year were \$38,900,000, as compared with \$75,000,000 for the same period in 1945 and \$20,600,000 for the 12 months of 1939. Other products whose exports were reduced this year compared with last, were iron \$139,100,000 (\$421,600,000 in 1945), non-ferrous metals \$126,900,000 (\$226,200,000 in 1945), and non-metallic minerals \$26,900,000 (\$35,200,000 in 1945).

The Otanmaki iron ore deposits in the North of Finland are to be exploited. A Finnish civil engineer is to visit the United States in order to consult with American experts regarding the processing of iron, titanium and vanadium ores. He will also study the possibilities of obtaining American smelters and steel plant. The ores, which consist mainly of magnetic and ilmenite, are said to have an average iron content of 28 per cent. and a considerable percentage of vanadium.

## Forthcoming Events

**October 15. Society of Dyers and Colourists** (Huddersfield section). Field's Cafe, Huddersfield, 7.30 p.m. Mr. H. Boothroyd: "Textile Production and Dyeing in Denmark and Sweden."

**October 15. Institution of the Rubber Industry** (London Section). Waldorf Hotel, Aldwych, London, W.C.2, 6.30 p.m. Mr. R. C. W. Moakes: "A Preliminary Evaluation of Synthetics in Rubber-to-Fabric Adhesion."

**October 15. British Society for International Bibliography.** Institution of Electrical Engineers, Savoy Place, Victoria Embankment, London, W.C.2, 2.30 p.m. Dr. B. M. Crowther: "The Use of the Universal Decimal Classification in Periodical Abstracting Services for Scientists and Engineers"; Dr. S. C. Bradford: "The Problem of Complete Documentation in Science and Technology."

**October 16. Institute of Welding** (North London branch). Technical College, Acton, W.3, 7.30 p.m. Dr. J. H. Paterson: "Development of the Modern Electrode."

**October 16. British Association of Chemists** (London Section). Gas Industry House, 1 Grosvenor Place, London, S.W.1, 7 p.m. Mr. J. H. F. Smith: "Fire and Explosion—I."

**October 16. Royal Institute of Chemistry** (London and South-Eastern Counties section). London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, 6.30 p.m. Dr. W. E. van Heyningen: "The Publicity of Science by Radio."

**October 16. Society of Chemical Industry** (Agriculture Group). Physical Chemistry Lecture Theatre, Royal College of Science, South Kensington, London, 2.30 p.m. Dr. F. Gross: "An Experiment in Farming the Sea."

**October 16. British Association of Chemists** (Liverpool section, jointly with the Association of Scientific Workers). Stork Hotel, Queen Square, Liverpool, 6.45 p.m. Conference on "Salaries and Working Conditions in the Chemical Industry." Speakers: Dr. McMorgan, chairman, Manchester branch, A.Sc.W.; Mr. F. Crone, area organiser, A.Sc.W.; Mr. Stewart Cook, organising secretary, B.A.C.; Mr. H. H. Hutt, chairman, Liverpool section, B.A.C.

**October 17. The Chemical Society.** Municipal College, Southampton, 7 p.m. Dr. H. J. Emeléus: "Chemical Aspects of Work on Atomic Fission."

**October 17. The Chemical Society.** The University, Western Bank, Sheffield, 2.30 p.m. and 6 p.m. Professor Jaroslav Heyrovsky: "The Principles and Applications of Polarography."

**October 17. Oil and Colour Chemists' Association** (London section). Royal Institution, 21 Albemarle Street, London, W.1, 6.30 p.m. Professor H. W. Melville: "The Chemistry of High Polymers—III."

**October 17. The Chemical Society.** Burlington House, Piccadilly, London, W.1, 7.30 p.m. Mr. R. A. Baxter, Mr. G. T. Newbold and Mr. F. S. Spring: "Pyrazine Derivatives"; Mr. L. J. Haynes, Mr. E. R. H. Jones and Mr. M. C. Whiting: "Researches on Acetylenic Compounds: Acetylenic hydroxy-acids and their Reactions."

**October 18. Association of Special Libraries and Information Bureaux** (Northern branch). Hornby Library, William Brown Street, Liverpool, 3, 3 p.m. Mr. A. B. Agard Evans: "Information Service and the Export Trade."

**October 21. The Chemical Society** (jointly with the Royal Institute of Chemistry, S.C.I., and the Bureau of Abstracts). London School of Hygiene and Tropical Medicine, Keppel Street, London, W.C.1, 6 p.m. Dr. G. M. Dyson: "A New Notation for Organic Chemistry."

**October 22. Hull Chemical and Engineering Society** (jointly with Yorkshire section of S.C.I.). Church Institute, Albion Street, Hull, 7.30 p.m. Mr. T. Andrews: "Modern Trends in the Whaling Industry."

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

### Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced.)

**STEWART PLASTICS, LTD.**, Teddington. (M., 12/10/46.) September 11, £1750 debentures; general charge (except etc.)

**BORAX CONSOLIDATED LTD.**, London. E.C. (M., 12/10/46.) September 9, Trust Deed dated September 2, 1946, securing £1,500,000 debenture stock with redemption premium diminishing from 104 per cent. to 101 per cent.; general charge (subject to etc.) \*£2,500,000. April 16, 1946.

**FLEETWOOD CHEMICAL CO., LTD.**, London, S.E. (M., 12/10/46.) September 12. Land Registry charge, to Barclays Bank, Ltd., securing all moneys due to or to become due to the Bank; charged on Camgate Farm Works, Long Lane, Stanwell. \*£1970 December 31, 1943.

**J. EVERSHERD & SON, LTD.**, Brighton, soap and candle manufacturers. (M., 12/10/46.) September 11, £10,000 charge, to E. H. Kempe, Brighton; charged on 16 and 18 Chancetonview Road, Worthing; 7 and 9 High Street, West Tarring; 2a Blatchington Road and 61 Sackville Road, Hove; 52 St. George's Road, Brighton; Robertsbridge Stores and "The Chequers," High Street, Robertsbridge; and 201 Battle Road, St. Leonards-on-Sea. \*£10,000. May 18, 1946.

### Satisfaction

**MIDLAND TAR DISTILLERS, LTD.**, Birmingham. (M.S., 12/10/46.) Satisfaction September 19, of debenture stock registered August 6, 1936, to the extent of £8500.

## New Companies Registered

**Cressett (Hersham), Ltd.** (420,616).—Private company. Capital £5000 in £1 shares. Manufacturers of and dealers in chemicals, plastics, etc. Subscribers: M. K. Chaplin; A. W. Sampson. Registered office: 87 Regent Street, W.1.

**Douglas Marshall, Ltd.** (420,153).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, disinfectants, dyes, etc. Directors: A. D. Marshall; L. Marshall. Registered office: 10-12 Copthall Avenue, E.C.2.

**Far East Exports, Ltd.** (420,622).—Private company. Capital £500 in £1 shares. Manufacturers and exporters of chemicals, drugs, disinfectants, fertilisers, etc. Subscribers: E. J. Edwards; E. R. Pinnell. Registered office: 22 Charing Cross Road, W.C.2.

**B.E.P. Products, Ltd.** (420,131).—Private company. Capital £100 in £1 shares. Manufacturers of and dealers in chemicals, gases, drugs, etc. Directors: P. L. Braithwaite; A. H. Preston; W. A. Edwards. Registered office: 5 Gregory Street, Loughborough.

**Epsilon Research & Development Co., Ltd.** (420,245).—Private company. Capital £100 in £1 shares. Chemical engineers, manufacturers of and dealers in chemical apparatus, etc. Subscribers: F. C. S. Tufton; A. W. Paterson. Solicitors: Simmons & Simmons, 1 Threadneedle Street, E.C.2.

## Company News

The interim dividend of **Greeff Chemical Holdings, Ltd.**, is announced as being 3½ per cent., as compared with 3 per cent. last year.

The nominal capital of **Anglo Chemical & Ore Co., Ltd.**, Palmerston House, E.C.2, has been increased beyond the registered capital of £5000 by the addition of £5000 in £1 ordinary shares.

**Petrochemicals, Ltd.**, River Plate House, South Place, E.C.2, has increased its nominal capital beyond the registered capital of £1000 by the addition of £4000 in £1 ordinary shares.

The lists of applications for the offer for sale at 51s. of 301,960 "A" ordinary £1 shares of the **Morgan Crucible Co., Ltd.**, were closed on Wednesday last week, the offer having been heavily over-subscribed. Permission has been granted to deal in the new shares, after allotment, and in £400,000 "A" ordinary stock.

## Chemical and Allied Stocks and Shares

**STOCK** markets have continued the better tendency which developed at the close of last week, buyers being attracted by the good yields on a large range of leading industrial shares, while the better Peace Conference news also assisted sentiment. The firmness maintained by British Funds was helpful, and, moreover, the majority of dividend announcements that have come to hand were regarded as encouraging. Best prices were not held, but the rally was most marked in the industrial section, where renewed buying of colliery shares on estimates

of the eventual compensation values was a feature.

Imperial Chemical strengthened 6d. to 42s. 3d. and Calico Printers were 9d. higher at 24s. on the new textile fibre news. Dunlop Rubber have been firm at 70s. 6d.; Lever & Unilever strengthened to 51s. on dividend estimates. Elsewhere, Greiff-Chemicals Holdings 5s. shares were 12s. following the raising of the interim dividend from 3 per cent. to 3½ per cent. In respect of the whole of the past year, the total payment of the latter company was increased from 11 per cent. to 12½ per cent. There was again a fair amount of activity around 5s. in the 2s. shares of Major & Co. B. Laporte were 98s. 9d., Monsanto Chemicals 5½ per cent. preference 25s., Fisons 55s., and Lawes Chemical 10s. ordinary 13s. 3d. Sanitas 9 per cent. £1 preference were 40s. and British Alkaloids 1s. ordinary 13s. 9d. Turner & Newall rallied well to 81s. 9d. on higher dividend hopes. General Refractories recovered to 18s. 7½d., United Molasses to 49s., while British Aluminium at 40s. 6d. were better. Triplex Glass, after the sharp decline which followed the halving of the dividend, showed a partial recovery at 35s. on expectations that the full results will show that a strong financial position has been maintained and give grounds for the view that earning power will recover in due course. Morgan Crucible £1 "A" ordinary shares, issues last week at 51s., commenced dealings at 1s. premium and are ranked as a sound industrial in view of the good dividend record and balance-sheet position.

In the coal-iron section, Carlton Main 41s. 3d., Bolsover 61s., Powell Duffryn 25s. 1½d., Shipley 42s. 6d., and Staveley 56s. 9d. were prominent. Guest Keen improved to 41s. 10½d., United Steel to 25s. 1½d., and Babcock & Wilcox rallied well to 60s. Allied Iron were 57s. 9d. and Stewarts & Lloyds 50s. 1½d. Low Temperature Carbonisation 2s. ordinary, which remained under the influence of the progress report, improved further to 3s. 9d. Tube Investments showed firmness at 118s. 9d. In other directions, Borax Consolidated were firmer at 42s. 6d., De La Rue £12 13/16, Distillers 130s. 6d., and there was a better trend in paint shares, Pinchin Johnson being 44s. 6d., Goodlass Wall 10s. ordinary 28s. 7½d., and, in response to hopes of a higher dividend, Lewis Berger strengthened to £6 9/16.

Boots Drug rallied well to 58s. 6d. following an earlier reaction. Beechams deferred were 25s., Griffiths Hughes 59s., and Sangers 32s. Dubarry Perfumery 1s. shares held firm at 6s. 9d. on the dividend. Rayon shares strengthened under the lead of British Celanese at 32s. Shares of the Cementation Co. have improved to 6s. 1½d., Plaster Products 5s. ordinary to 13s., while British Plaster Board 5s. ordinary were

32s. 9d. and Associated Cement rallied to 62s. 6d. Oils were better inclined, Shell being 89s. 4½d. British Borneo Petroleum, after an earlier decline, recovered 2s. 6d. to 30s. 9d., while gains were recorded by Mexican and Canadian Eagle; Lobitos rose to 65s. on higher dividend hopes.

## British Chemical Prices

### Market Reports

**T**HERE has been little change in the general trading conditions on the London chemical market during the past week and all sections of the market have continued firm, with new business on a moderate scale. Spot transactions are difficult to negotiate in a number of directions owing to tightness in supplies, but with regard to deliveries against contracts the movement is steady and, in the aggregate, fairly substantial. In the general run of the potash and soda products the demand has been more than sufficient to cover the quantities on offer, and a considerable export inquiry remains in circulation. There has been a steady call for oxalic acid, acetic acid and sulphuric acid, and an active demand is reported for white powdered arsenic, formaldehyde and sulphate of alumina. There has been no easing in the pressure for the lead compounds and quoted rates are firm. Very firm price conditions obtain in the coal-tar products section and the demand in most cases exceeds available supplies.

**MANCHESTER.**—Firm price conditions have been maintained in virtually all sections of the Manchester chemical market, but while the tendency is upward in a number of directions there has not been much actual change on balance for the week. Among the soda products, caustic, soda ash, bicarbonate, and sulphate are meeting with a steady demand on the home market, and deliveries of ammonia and magnesia compounds have been fully maintained at their recent levels. The mineral acids are meeting with a good demand. Shippers have also been in the market for a fairly wide range of products, though in several directions export business is not easy to arrange. A moderate flow of new orders has been reported in the tar products section and deliveries against old business in the leading light and heavy classes account for substantial quantities.

**GLASGOW.**—Very little change has been shown in trading in the Scottish heavy chemical market during the past week. A heavy demand for all classes of chemicals has been registered, both for spot and forward deliveries. Deliveries against contracts are well up to standard. In the export market a large demand for formaldehyde, Glauber salts, zinc oxide, sulphuric acid, sulphur and tanning chemicals has been experienced. Prices are very firm and the supply is no easier than in the past.



## Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted may be obtained from the Patent Office, Southampton Buildings, London, W.C.2., at 1s. each. Numbers given under "Applications for Patents" are for reference in all correspondence up to acceptance of the complete specification.

### Applications for Patents

Liquid flow control.—Aluminium Plant & Vessel Co., Ltd., and H. F. Goodman. 27399.

Welding metals.—Aluminium Plant & Vessel Co., Ltd., W. K. B. Marshall, and J. F. Lancaster. 27703.

Weed-killing compositions.—American Chemical Paint Co. 26489.

Aluminium, etc., coatings.—American Chemical Paint Co. 26896.

Resinous materials.—American Cyanamid Co. 26697-8.

Biguanides.—American Cyanamid Co. 27015-21.

Catalysts.—C. Arnold. (Standard Oil Development Co.) 26906.

Volatile fuels.—C. Arnold. (Standard Oil Development Co.) 26907.

Hydrocarbons.—C. Arnold. (Standard Oil Development Co.) 26908.

Treatment of gaseous mixtures.—C. Arnold. (Standard Oil Development Co.) 26909.

Hydrogen mixtures.—C. Arnold. (Standard Oil Development Co.) 27050.

Nitro-compounds.—Boots Pure Drug Co., Ltd., J. Cymerman, and W. F. Short. 27043.

Magnesium base alloys.—R. M. Bradbury. 26668.

Aluminium alloy.—R. M. Bradbury. 26669.

Treatment of viscose products.—British Celanese, Ltd. 26590.

Dyestuffs.—Ciba, Ltd. 27027-8.

Refining of aluminium.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, & Camargue. 26468.

Triple superphosphate.—Davison Chemical Corporation. 26753.

Polymeric materials.—E.I. Du Pont de Nemours & Co. 26842.

Dyestuffs.—General Aniline & Film Corporation. 27070-1.

Carboxylic acids.—B. F. Goodrich & Co. 26440-2.

Carboxylic acid compounds.—B. F. Goodrich Co. 26579-82.

Organic compounds.—B. F. Goodrich Co. 26696.

Polycarboxylic acids.—B. F. Goodrich Co. 26821-2.

Cellulose solutions.—Heberlein & Co., A.G. 26827.

Chemical reaction process.—International Pulverising Corporation. 26759.

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Asphalt Impervious Cement	French Chalk	Resins (synthetic)	Synthetic Glues
Barytes Substitute	Lead Nitrate	Rubber Accelerators	Talc
Carbonate of Potash	Manganese Borate	Sodium Acetate	Temperature Indicating
Caustic Potash (all grades)	Methyl Cellulose	Sodium Bichromate	Paints and Crayons
Cellulose Adhesives	Methylene Chloride	Sodium Chlorate	Thio Urea
Coumarone Resin	Oxalic Acid and Salts	Sodium Nitrate	Wax Substitutes
Cryolite (Synthetic)	Plasticisers	Sodium Nitrite	Wood Flour
			Zinc Chloride. Etc., etc.

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Polymerisation processes.—Mathieson Alkali Works. 26921.

Bauxite regeneration.—N.V. de Bataafsche Petroleum Maatschappij. 26493.

Vitamin compounds.—N.V. Organon. 26911-2.

Emulsions.—National Chemical Products Proprietary, Ltd. 26895.

Emulsion breaking apparatus.—C. E. North, and A. P. North. 26839.

Insecticides.—Pan Britannica Industries, Ltd., and E. J. N. Cakebread. 26406.

Polylene alcohols.—Roche Products, Ltd. (F. Hoffmann-La-Roche & Co., A.G.) 26789.

Acid derivatives.—Roche Products, Ltd., F. Bergel, A. L. Morrison, A. R. Moss, W. H. Kennedy, M. Königstein, and H. Rinderknecht. 26522.

Dinitroresorcinol.—L. Rubinstein, and I.C.I., Ltd. 26540-1.

Dinitroresorcinate.—L. Rubinstein, and I.C.I., Ltd. 26542.

Hydrocarbon materials.—Yorkshire Tar Distillers, Ltd., D. W. Milner, and E. C. Holdsworth. 26568.

Nitropolystyrene.—H. Zenftman, A. McLean, and I.C.I., Ltd. 26539.

### Complete Specifications Open to Public Inspection

Polyethylene-oxidation inhibitor.—Bakelite Corporation. March 17, 1945. 7257/46.

Anti-oxidants for polyolefins.—Bakelite Corporation. March 17, 1945. 7578/46.

Preparation of alkylhalogenosilanes.—British Thomson-Houston Co., Ltd. March 15, 1945. 7245/46.

Alkylation of halogenosilanes.—British Thomson-Houston Co., Ltd. March 15, 1945. 7246/46.

Process for the manufacture of insulating materials against heat and cold.—Bumax Werke A.G., Durrenasch. March 12, 1945. 34532/45.

Process of manufacturing a composition from waste liquor of cellulose.—Celludur, A.G. March 26, 1942. 11950/42.

Oxide layers obtained upon aluminium and its alloys by electrolytic means.—Cie. de Produits Chimiques et Electro-Métallurgiques Alais, Froges et Camargue. Nov. 11, 1943. 28064/45.

Preparing a material which has a high content of carotin.—Coöperatieve aan en Verkoopvereniging Centraal Bureau vit het Nederlandsche Landbouw-Comite, G.A. Oct. 17, 1941. 24028/46.

Colouring materials.—E.I. Du Pont de Nemours & Co. March 14, 1945. 7839/46.

Manufacture of long-chain carboxylic acids.—E.I. Du Pont de Nemours & Co. March 17, 1945. 8311/46.

Recovery and utilisation of tin.—Hanson-Van Winkle-Munning Co. May 21, 1943. 12203/44.

Electric insulating oil and methods of pre-

paring the same.—O. A. Harlahti, and C. A. F. Gustafsson. March 14, 1945. 21660/46.

Expression of liquids from solids, and in particular to the expression of oil from oil-bearing materials.—Lever Brothers & Unilever, Ltd. Jan. 21, 1943. 25561/46.

### Complete Specifications Accepted

Process for removing organic sulphur compounds from gases.—Gas Research Board, and A. Key. Feb. 26, 1945. (Addition to 561,679.) 580,474.

Manufacture of piperidino-ethanol ester of di-n-butylacetic acid.—J. R. Geigy, A.G. Aug. 4, 1943. 580,392.

Acetylene tetraesters of alpha-methylene monocarboxylic acids and polymers and copolymers thereof.—I.C.I., Ltd. Oct. 16, 1943. 580,469.

Process for the manufacture of a protein plastic.—E. Kawerau. Aug. 27, 1943. 580,429.

Process for manufacture of magnesium products.—E. P. Newton. (Marine Magnesium Products Corporation.) Nov. 12, 1943. 580,267.

Dyestuffs of the anthraquinone series.—Sandoz, Ltd. July 16, 1943. 580,351.

Dyestuffs of the anthraquinone series.—Sandoz, Ltd. July 16, 1943. 580,352.

Production of cellulose ethers.—J. H. Sharphouse, and J. Downing. Nov. 22, 1943. 580,359.

Olefin polymerisation process.—Shell Development Co. April 12, 1943. 580,310.

Process for the production of polymers and apparatus therefor.—Standard Oil Development Co. June 26, 1942. 580,407.

Treatment of a copper surface to prevent molten metal adhering thereto.—Standard Telephones & Cables, Ltd., E. Mills, and E. C. J. Marsh. April 21, 1944. 580,379.

Production of artificial insolubilised wet-spun protein filaments.—R. H. K. Thomson, D. Traill, and I.C.I., Ltd. Sept. 6, 1944. 580,434.

Production of insolubilised filaments, threads, films, or the like shaped products by the wet spinning of protein solutions.—W. A. Caldwell, J. Jack, and I.C.I., Ltd. Aug. 9, 1944. 580,508.

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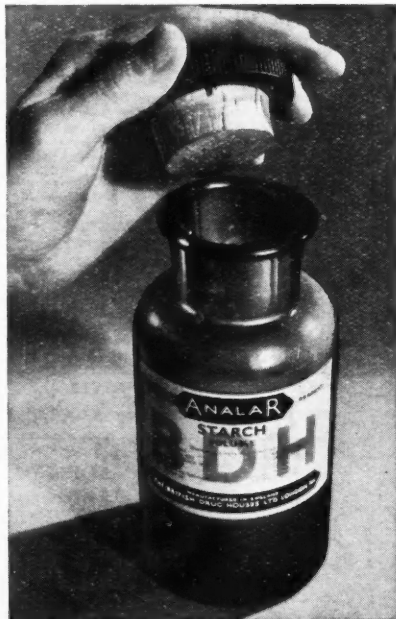
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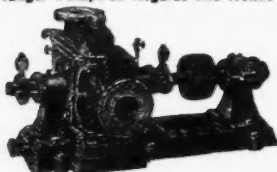
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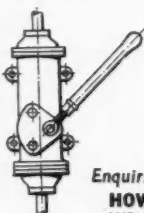
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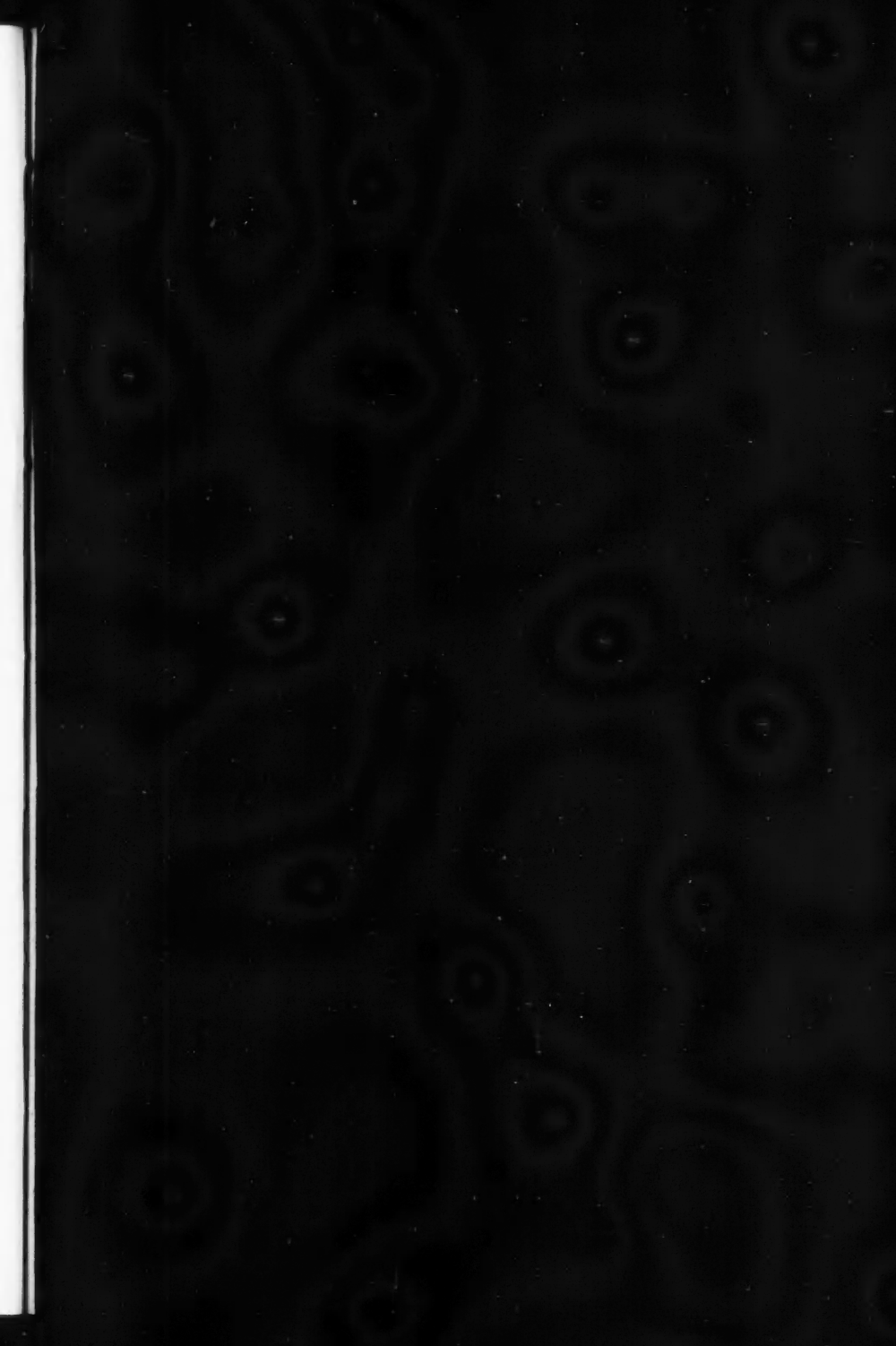
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